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THE NATURE-STUDY REVIEW

Volume XI, 1915

ELLIOT R. DOWNING
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THE UNIVERSITY OF CHICAGO
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THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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VOL. 11 JANUARY, 1915 No. 1

The Annual Meeting and Election of Officers

The opening session of the meeting was held in the Zoology Building at the University of Pennsylvania. It was a roomful of the members of the American Nature-Study Society who greeted Mrs. Comstock as she rose to give the address as retiring president. True, the room was not a *very* large one and yet it was as generous a representation of our membership as has been present at a winter meeting for many years. The address which appears in this issue was heard with greater pleasure than our readers can have in reading it for in cold print it lacks, somewhat, of the charming personality which has made its writer so efficient a president these two years past.

Following this address M. A. Bigelow of Teachers College (the initials were incorrectly given in the December number), gave a paper on the Relation Between the Introductory Science of the High School and Nature-Study and Biology. This was provocative of a good deal of discussion. It will appear in full in a later number of the REVIEW. Mr. C. H. Robison of the Upper Montclair, (N. J.) Normal School led the discussion which continued for more than an hour, many of those present taking part. The afternoon meeting was a joint session with the School Garden Association of America. It was held in the Botany Building to get the use of a lantern. Mr. V. E. Kilpatrick, President of the School Garden Association, was in the chair. Commissioner Claxton could not be present but Miss Ethel Gowans, one of the able aids of the Commissioner in the newly established division of school gardens, outlined in a very clear way the work they are trying to push. The Commissioner desires to aid teachers to fit themselves for school garden work, to stimulate garden work

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particularly in the south where the people suffer for lack of fresh vegetables, to facilitate the disposal of garden products and to assist in the instruction in canning garden stuff that otherwise would go to waste. We shall present in the February number an article from Miss Gowans outlining the qualifications and preparation desired in the garden instructor.

The paper of Miss Margaret Aherne on the Plan of Nature-Study, in the Gary, (Ind.) Schools elicited many questions. It is to be published in the February number.

Mr. O. G. Shields gave many instances of wild animals finding their way to food; of domestic animals finding their way home by the use, he believes, of a sense or senses we humans do not possess. This interesting paper will be published in an early number.

Mrs. J. Willis Martin advocated more publicity for school garden work, a campaign to educate the tax-payer on its values so he would demand for his children instruction in garden work as he now does for the three R's.

Miss Ella Carter gave a delightful talk on the Philadelphia School Garden and illustrated it with a number of fine lantern slides.

The Thursday morning session was devoted to a discussion of the Principles of Organization of Nature-Study work incorporated in the several outlines of Nature-Study, published in the December number of the REVIEW. Miss Laura E. Woodward, of the Trenton, (N. J.) Normal School opened the discussion.

Many more of those present participated and the spirited discussion lasted all morning. Instead of attempting to formulate at this meeting the principles of organization for which the Society wishes to stand, it was deemed expedient to ask the Council to draw up a set of such principles for publication in the REVIEW. These to form the basis of additional discussion in the pages of the REVIEW and at the next meeting of the Society with a view to adopting them more or less modified at that time.

The afternoon session was held at the Philadelphia Normal School for Girls. Dr. Adeline F. Schively spoke on the local nature-study situation. Then the nature-study equipment, samples of work and the building of the Normal were inspected under the guidance of Mrs. L. L. W. Wilson.

The business was transacted after the addresses on Wednesday morning. The ballot resulted in the election of the following

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officers and council directors holding over from last year are indicated by 1. Those newly elected by 2, while the ones who represent the local branches are designated 3.

President—L. H. Bailey, N. Y.

Vice-Presidents—M. A. Bigelow, N. Y.; Otis W. Caldwell, Ill.; B. M. Davis, Ohio; F. L. Holtz, N. Y.; B. M. McCreedy, Ont.

Directors—[1]L. H. Bailey, N. Y.; [2]Anna B. Comstock, N. Y.; [2]John A. Dearness, Ont.; [1]J. A. Drushel, Mo.; [1]C. F. Hodge, Ore.; [2]Jas. G. Needham, N. Y.; [2]Alice J. Patterson, Ill.; [1]Susan B. Sipe, D. C.; [2]W. A. Slingerland, N. Y.; [3]Grant Smith, Ill.; [3]H. C. Drayer, Mo.; [3]G. Straubenmueller, N. Y.; [1]Gilbert Trafton, Minn.

Secretary-Editor—Elliot R. Downing.

The question of calling a meeting for the Summer at San Francisco in connection with the Exposition was left to the Council to decide after consultation with the California Branch of the Society.

A resolution was passed instructing the Secretary to extend greeting from the American Nature-Study Society to the corresponding society in England, the School Nature-Study Union, at its session in London, January 4–9.

Editorial

With this number we begin Volume XI. A decade of achievement is worth pausing a moment to consider. Surely a magazine that has maintained itself thus long is filling a real need. Moreover it has never appeared healthier. In a year and a half the subscriptions have increased fifty per cent. It needs only to be more widely known to double its number of patrons. Then it would easily be self-supporting. Fortunately for the nature-study movement in this country there have been and still are those willing to sacrifice time and money to further its interests, so much do they believe in its importance. Do you believe in nature-study? Read the retiring president's address in this number to appreciate what it has done and is doing. Do you not believe in it enough to recommend the REVIEW to your friends?

The marvellous material progress of our century is due to our conquest of Nature. Let us be humble in our pride, however. We have subjugated but a tiny fraction of the mysterious forces that weave the pattern of our destinies. The illustrious savants

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who will continue the conquest are school children now. Our daily bread depends as never before on a comprehension of physical and biological phenomena. The average man, not the expert alone, must be scientific. This will be even more true for our children.

The world's intellectual life has always been tremendously stimulated by Nature. Our declaration of mental independence is her gift. Our aesthetic sensibilities are reactions to her stimuli. Our moral sentiments are conditioned by her revelations to us. Can we but bring the child into sympathetic touch with her, open his eyes to her beauties, lead him to see the significance of his daily environment, no less wonderful than commonplace, teach him to think in terms of actualities and be obedient to the dictum of her facts, guide him to a realization of her might, mystery and brooding care, can we do but a tithe of all this we shall educate that child. Nature-Study strives for this. It asks that the child be left in part at least in the care of Nature who has been the beneficent instructor of the race.

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The Growth and Influence of the Nature-Study Idea

By Anna Botsford Comstock

Extract from the Address of the Retiring President of the American Nature-Study Society, delivered at Philadelphia, December 30, 1914.

"The name nature-study designates the movement originating in the common schools to open the pupil's mind by direct observation to a knowledge and love of the common things in the child's environment. It is a pedagogical term, not a scientific term. It is not synonymous with the old term 'natural history,' nor with 'elementary science.' It is not popular science."—is the definition of the term Nature-Study by Liberty Hyde Bailey—and no one has defined it better.

However, a great idea may be represented but not limited by words, and thus, although the term Nature-Study may have had its origin in the schools, the nature-study idea almost from the first overflowed the school boundaries to enrich and make happier the lives of those who loved the life of the woods and fields, and who would fain know something of the mysteries and wonders therein hidden.

During the past year I chanced to make a discovery as to the first appearance of nature-study in our educational system, although it was then termed "object lessons with plants and animals." I found this in a programme of an educational meeting at the Oswego Normal School, that beacon light in the pedagogical world the second half of last century. This meeting was called by the great teacher, Principal Sheldon, for February 11, 1862, and its object was to examine into a system of primary instruction by object lessons. The Committee of Examination consisted of prominent educators of New York, New Jersey, Ohio, Massachusetts, and Vermont. On this programme we find lessons on plants and animals. It was, in fact, excellent nature-study, and consisted of observing the form of living beings as related to their life. I have met some people who were present at that meeting and they have told me that Principal Sheldon was enthusiastic over this method. He was confident that it would lead the child to know the forms and understand the habits of the common animals and plants of his environment.

Evidently the carrying out of this programme was seed sown, although it took some years for it to germinate; but it was vital,

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and finally bore fruit. When Cornell University made its survey of the public schools of New York, before launching its nature-study propaganda, almost the only nature-study to be found in the schools of the state was that carried on by graduates of the Oswego Normal School.

Ten years later another important step was taken. The summer school of Agassiz at Penikese had a great influence upon nature-study in the schools and universities and paved the way for the nature-study idea. While the purpose of Agassiz was to study marine life in a truly scientific manner, yet the fact that he took his pupils to the place where the life was growing was revolutionary as an educational idea. Although as a teacher he was devoted to pure science, yet many of his maxims have become the slogans of the nature-study vanguard.

Thus, we can see that, although the term nature-study did not appear until 1880 the idea preceded the christening by some years. It is not in the scope of this address to give a history of those educators of high ideals, like H. H. Straight, Wilbur Jackman, A. Boyden, F. O. Payne, Mrs. L. L. W. Wilson and Charles Scott, who did such heroic work for nature-study during the decade following 1880. Let us glance for a moment at the difficulties encountered by these educational leaders.

At the time that nature-study first attracted the attention of the scientific world, the teaching of the biological sciences was under the heavy sway of German laboratory methods. The structure of animals and plants was studied to the last detail with the aid of the microscope. Morphology had become a fetish and to it was sacrificed all interest relating to the life of the dissected creature. Any living organism whether it were a primrose, a swallow, a cat, or a caterpillar, must perforce be infiltrated with paraffin and made into ribbon sections before it was considered to be worthy of the attention of a man of science.

The era immediately preceding this had been given over almost wholly to the naming and classification of organisms. The Species-hunter with the greatest number of scalps at his belt was considered the greatest scientist; but now the Species-hunter and his scalps and all he had ever hunted were relegated to the dark ages by a large number of scientific men. This might not have been so bad, if it had been confined to colleges and universities. It might be expected that since it took so long to evolve

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the world and its organisms, there would also be stages in the study of the same. The universities can afford to wait for their enlightenment to develop.

Unfortunately this state of things was not confined to universities, for the pupils trained in these institutions of learning went forth to teach in the secondary schools, and carried with them the cult of cutting.

Thus it was that nature-study in its infancy found the Man with the Microtome occupying the field to its outermost boundaries. And this Man liked nothing better than to spank the infant on every possible occasion, because he considered it not worthy of rearing. But spanking does not kill the healthy young; and our infant did not howl when whacked,—it just went somewhere else and kept on growing. As long as it was merely spanked all was well; but as it grew into blooming childhood, the Man with the Microtome joined with whatever Species-hunters there were left, and the two forthwith proceeded to inoculate Nature-Study with a combined virus which nearly caused the untimely death of the victim. The attempt to reduce science as such to child's size and call it nature-study did more to damage the cause than any other single factor.

Just here most opportunely a reaction set in against the Man with the Microtome. Some brave souls dared to arise and declare that an animal would not have had any organs to be made into microtomic ribbons, if it had not had use for these organs; and therefore it might be well to discover their use as well as their structure. These revolutionists hastened to name themselves "Ecologists" not daring to wait to be christened by the oligarcy of the laboratories.

The Ecologists at once came to the aid of nature-study, for ecology is merely nature-study grown to robust middle age. The work of the Species-hunter and the work of the Man with the Microtome were both of use to the Ecologist for he took their results into the field with him and used them in discovering how manifold life was affected in its development and habits by its environment. The Ecologist was fired with the nature-study idea and he had come to stay; but he was slow in making his influence felt in the laboratories of the universities and more so in the secondary schools. It took too much time to work out the problems of the interdependence of life; it was much easier to catch something, chloroform it, and cut it into sections.

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I would not for a moment be understood to assert that no scientific man upheld the nature-study idea in the universities during this period. The work of such men as Shaler, Hodge, the Coulters, Jenkins, Kellogg, Bailey, Comstock, Schmucker, and many others deserves the most profound gratitude from every nature lover. Nor would I ignore the debt that nature-study owes to scientific ideals, the chief of those being the whole-hearted search for truth. Perhaps in the end, this emphasizing the fundamental need of truthfulness will have compensated for all that nature-study suffered at the beginning from the narrow arrogance of the Man with the Microtome.

It is the nature-study idea mainly that has been responsible for the salutary changes that have been taking place in the teaching of biological sciences in the secondary schools. The idea is at last filtering through educational systems, that to appreciate and understand the structure of a bird the pupil should have seen a few birds in the woods and fields and there have studied their habits and learned something of their ways and problems. However, the work of nature-study in this matter has only begun. When it finally accomplishes its mission the pupils that come up to the universities from the high-schools will understand what the professor of morphology is trying to teach, and those who never come to universities at all will be able to go out into the fields and without the aid of books or teachers read the lessons in God's great laboratory.

Nor, is this influence limited to teaching in secondary schools. The nature-study idea has finally made itself felt through the Ecologists in the universities. Where twenty-five or thirty years ago such a person as a field naturalist in any specialty, was rarely to be found among the students of the universities, now there are many institutions where such a person is not an anomaly.

Not the least beneficent results of the nature-study influence are those seen in the change of teaching methods in the elementary schools, where nature-study has become well established. These benefits are manifold, but there are two which deserve special consideration: First, that nature-study gives an inspiring thought core for routine work, and, second, it is of great aid in establishing a new and salutary kind of discipline.

"Ideas before words" was one of Agassiz's mottoes. What an illumination this should be for the elementary teacher. The child

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must read, why should he not read something related to his own interests? The child must write, why should he not write concerning that which he knows? In learning to read and to write let the child follow the history of the race, for language either oral or written was invented or evolved because of the human need to express ideas. And if the child must draw, let him draw the thing as he sees it in the world of things as they are to him. And, thus, let him keep pencil and brush as means of self-expression. Nature-study is, perhaps, the most universal and natural means which the teacher has, for keeping language work and drawing mediums for self-expression.

As an aid in establishing discipline nature-study has a wide influence. First, by its own inherent qualities it takes a pupil away from the drill of the routine work, changes the trend of his thought at a time when his nerves and also the teacher's nerves need to have the tension relieved. Thus by an entire change of thought, it affords a mental and spiritual rest; for, when nature-study is at its best the child is quite unconscious of mental effort. But, perhaps, it gains its greatest disciplinary value by compelling the teacher to say frankly to the child's questions "I do not know." It is true that the saying of "I do not know" by a teacher has been a stumbling block to the introduction of nature-study. The teacher was unwilling to put herself in such a position before her pupils, but many of them have now learned to say it with confidence and a graciousness that takes the child by the hand and, as a companion, leads him out into the realm of the unknown, where the two may discover the answers to the questions together. This good comradeship is a most valuable asset to the wise teacher enabling her to avoid those conflicts which are so destructive to discipline and also to the teacher's influence.

Professor Bailey says "the purpose of the nature-study movement is to enable every person to lead a richer life whatever his profession may be." The nature-study idea stands fundamentally for human comradeship with the life out-of-doors and this idea was from the first a large factor in the Country Life Movement. First of all, in this regard, nature-study literature and its effect deserves mention. Formerly there was no way for the untrained person to become trained in the study of natural objects except through the laboratories of schools and universities. And even with this training he might be quite unequal to this enterprise. I knew a man once, who did a notable research

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of the nervous system of a rabbit, and I discovered to my astonishment that he did not surely know a cottontail as he saw it crouched in its form.

The nature-study movement at the psychological moment supplied the much needed books, books about flowers and animals written so simply that whoever could read might understand. The Species Hunter and the Man with the Microtome snorted in concert and in derision at this kind of literature. But the snorting was wasted effort. Many people throughout the country began to appreciate the nature-study idea, which for them meant a pleasant speaking acquaintance with flowers, trees, the birds and butterflies. It was not scientific education that they desired, it was just a general intelligence as to their environment. So the books came to stay and more and better came to keep them company, until, now, thanks to the nature-study idea, the man or woman does not need to go to college to be able to know something of the flora and the fauna and the geology of his farm. How much this ability has added to the health and the happiness of country communities cannot be estimated.

I spoke to you last year at length upon the practical benefit afforded the agriculturist, the horticulturist, and the gardener, by nature-study. This assistance is so great that it cannot be estimated or appreciated during the present generation. Nature-study deals with the basic principles of these vocations. But the good that it may do to the agricultural pursuits or the benefits it may confer upon communities through education in hygiene, are after all byproducts of the greater work which it does for the spirit and the intelligence of human beings, whatever may be their pursuits.

In fact, there are so many practical benefits bestowed upon the world by the nature-study idea that there is a temptation to regard it only from the practical standpoint. But this is a limitation which should never be permitted. We should realize that to gain the most practical results the nature-study idea should do the work unhampered by economic boundaries. As an instance of this, note the great work done through the nature-study idea in the conservation of wild life. With a fatuity that our descendants of three centuries hence will characterize a criminal stupidity we have exterminated many species of birds, destroyed many interesting and harmless wild animals, hacked down our trees ruthlessly and cleared our streams of valuable fish. Men of

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science had remonstrated in vain. It was not until the nature-study movement permeated the people throughout the land that they came to resent this extermination; and not until then was there a sufficiently strong popular opinion created to establish and carry out protective laws. This is well shown in the legislation concerning birds. Bird-study was one of the first and has always been one of the most important phases of the nature-study movement. But who that has watched the growth and strength of the bird protection propaganda, would for a moment say that it had its inception or gained its strength because of its economic importance? Pure sentiment,—a love of birds in the hearts of thousands of people all over the land, created the crusade. The economic considerations trailed after; and yet there has hardly been in the history of any country a movement of greater economic importance. This is a cogent illustration of the value, if not limiting the nature-study idea or its scope to what seems to be practical use. It should be remembered that in all history crusades have been born and lead of the spirit.

In reviewing the progress of nature-study in the schools we may be reassured, because the phases through which it has passed successfully are enough to have proven its robust qualities. Coincident with the toy science made over from the university laboratories came what has been aptly termed the cute and fluffy stage, which resulted from the impact of the nature-study idea upon the imagination and enthusiasm of those teachers trained in pedagogy but utterly untrained in science. This resulted in an effervescence that frothed over and soon dampened and rendered soggy the nature-study section of the school curriculum.

Now normal schools and teachers' courses in the university summer schools give the teacher the needed training, and we can see even so soon the prophecy fulfilled, which L. H. Bailey made twenty years ago. He said:

"Nature-study is not science. It is not knowledge. It is not facts. It is spirit. It is concerned with the child's outlook on the world.

"Nature-study will endure, because it is natural and of universal application. Methods will change and will fall into disrepute; its name will be dropped from curriculums; here and there it will be encased in the schoolmaster's 'methods' and its life will be smothered; now and then it will be overexploited; with many persons it will be a fad: but the spirit will live."

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Nature-Study at the Van Vlissingen School

GEO. A. BRENNAN

For many years nature-study has been an important study in the Van Vlissingen School, and it has been of practical nature. Roseland, the Chicago suburb in which the school is located, was for years a farming community. It was settled by well-to-do Hollanders in 1849. These people were expert gardeners, and as a result, their farms and gardens were models, yielding sometimes two and three crops a year. Home training has helped greatly in developing a taste for this kind of work in their descendants.

When Pullman was founded in 1880 on the shores of Lake Calumet, many of the gardens and farms in the eastern part of our school district were sold and subdivided into lots for the building of homes. On the outskirts of the settlement from one to three miles away, there are still many truck gardens of five to twenty-five acres, and there are many vacant plots scattered through the community. There is thus room and opportunity for the children to obtain a practical knowledge of gardening in addition to what the school can offer.

Many of our people own their own homes, and they take pride in having gardens and lawns; and this is also true of many who rent. Thus the children are often able to give practical suggestions to the other children and to the teachers. The following course is in use at our school:

KINDERGARTEN

Walks, noticing trees, flowers, gardens, etc.
Sense games.
The use of nuts, seeds, etc., as material for decorations.

FIRST GRADE

Flowers, trees, leaves, fruits, nuts, etc.
Window gardens.
Winter bulbs.
Progressive changes in winter.
Germinations of seeds.
School gardens.

SECOND GRADE

Window gardening.
Vegetables grown in home garden.
Insect life. Collect cocoons to keep over winter.

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Horses and cows.
Bulbs for winter flowering.
Bulbs for summer flowering.
School gardens.
Care of plants.
Bird study.

THIRD GRADE

Tree studies for autumn.
Aquaria.
Home-grown plants.
Tree studies for winter. Trace changes in trees from autumn to winter.
Window gardening.
School gardens.
Bird study.

FOURTH GRADE

Collect and describe the wild flowers growing in this vicinity.
The life cycle of some common plants.
Harvest studies in connection with the pupils' exhibits of home-grown plants or crops.
Simple study of ventilation, heat and cold.
Germination of seeds.
Propagation of plants.

FIFTH GRADE

Insect enemies of plants and how to destroy them.
Distribution of seeds. Make a collection showing various types.

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Planting of outdoor bulbs by pupils. To be done at school or at home. To be planted in October or early November before severe frosts.

Study soils and fertilizers; effects on plants.

Window gardens.

Germination of seeds.

Home and school gardens.

SIXTH GRADE

The parts of the plant and the office of each part, working out the general idea of exogen and endogen. Corn and other tall grasses to be obtained for endogens. Growing trees, shrubs, and other plants for exogens.

Collect various woods used in furniture, etc., and study how they are brought to market and prepared for use.

Decoration of home and school grounds; park and landscape gardening.

Propagation of plants.

The development of trees throughout the year.

SEVENTH GRADE

Special study of pollination; use rose or apple-flower as type of dicotyledonous plant; tulip for monocotyledonous plant, calling special attention to the perianth.

Molds, blights, bacteria, etc., including those attacking trees and other plants.

Bordeaux-mixture for killing molds and blights.

Insects, especially moths and butterflies in all their phases.

Brief study of circulation, respiration, digestion.

EIGHTH GRADE

Development of a tree, using note book, sketching changes observed.

Select suitable trees for the school district; learn how to plant and care for them in a suitable manner.

Destructive insects—tussock and coddling moths, potato bug, tomato worm, plant lice, etc.; various scale insects—cotton scale, San José scale, oyster scale.

Beneficial insects; lady-bug, ichneumon fly, etc.

Continue to use Bordeaux-mixture for molds and blights.

Insecticides—Paris-green or arsenate of lead for chewing insects and their larvæ; kerosene emulsion and lime-sulphur solution for plant-lice and scale insects. Combination treatment by fungicides and insecticides.

Hot-beds and cold-frames in the propagation of plants.

Tree surgery.

Elementary plant-ecology.

Elementary treatment of the geological history of the earth.

Nervous system.

In order to handle the course satisfactorily, it has been necessary to give the teachers special instruction in these lines, for the reason that they usually know very little about practical gardening.

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Some of our teachers in recent years, have been much better equipped. The field of nature-study is vast, and we realized that we should be compelled to subdivide the teaching into various departments represented by committees. Each group specialized in the department to which it was assigned, giving knowledge to and receiving it from other committees. Our thirty-four teachers were organized into fourteen groups as follows:

COMMITTEES OF TEACHERS ON NATURE-STUDY

1. HORTICULTURE—Destructive insects; Insecticides; Tree surgery.
2. PLANTS AND PROPAGATION—Forestry.
3. AGRICULTURE—Vegetable gardens; Destructive insects; Commercial fertilizers.
4. MOULDS AND BLIGHTS—Bacteria; Fungicides.
5. FLORICULTURE—Flower gardens.
6. POLLINATION—Study of Burbank, Darwin, De Vries. Hodge for reference. Experiments by pupils.
7. WINDOW GARDENS. 8. BULBS. 9. BIRD STUDY. 10. AQUARIA. 11 MUSEUM. 12. CAMERA CLUB. 13. LIBRARY. 14. PHYSICS—Electricity; Magnetism, etc.; Irrigation; Drainage.

This plan worked out admirably during the last four years in developing the teaching of nature-study. It has awakened enthusiasm on the part of teachers and parents, and the children found it a fascinating study. The old method of teaching nature-study was that of bringing in leaves, flowers, and other things into the schoolroom for dissection, naming of parts, etc. Real nature-study is the study of life and watching the unfolding and developing of nature in home and school gardens, in field, wood or lake.

To help the teachers and pupils, we have collected a little library on nature-study. There are books and pamphlets on animals, plants, and minerals. The teachers have additional books in their own private collection. The pupils use this library extensively, taking the books or pamphlets home, where they are frequently read by their parents.

ANIMALS

1. Animals of the World, Brehm.
2. American Natural History, Hornaday.
3. Manual of Vertebrates, Jordan.
4. Zoology, Nicholson.
5. Zoology, Chambers.

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BIRDS

1. Color key to North American Birds, Chapman and Reed.
2. North American Birds' Eggs, Reed.
3. Song Birds, Reed.
4. Water Birds, Reed.
5. First Book of Birds, Miller.
6. Second Book of Birds, Miller.
7. How to Attract the Birds, Blanchan.
8. Wild Birds in City Parks, Walter.
9. Birds of the Chicago Area, Woodruff.
10. Birds of Lakeside and Prairie, Clark.
11. Secrets of the Woods, Long.

PLANTS

1. Wild Flowers East of the Rockies, Reed.
2. Field Book of American Wild Flowers, Mathews.
3. Field Book, Gray.
4. Lectures on Botany, Lincoln.
5. How to Know the Wild Flowers, Dana.
6. Practical Botany, Bergen and Calwell.
7. Plant Relations, Coulter.
8. How to Know the Ferns, Parsons.
9. Flower Bulbs, Rexford.
10. Plants and Their Children, Dana.
11. Glimpses of the Plant World, Bergen.
12. Book of Nature, Hooker.
13. The School Garden Book, Weed-Emerson.
14. How to Make School Gardens, Hemenway.
15. Practical Fruit Grower, Maynard.
16. Fruit Growers' Guide Book, Favor.

GENERAL

1. Year Books of the Department of Agriculture.
2. Field Work in Nature-Study, Jackman.
3. Nature-Study Readers, Troeger.
4. Short Stories of Our Shy Neighbors, Kelly.
5. Easy Lessons about Common Things, Adams.
6. India and Ceylon, Haeckel.
7. Full set of books by John Burroughs.

INSECTS

1. Manual for Study of Insects, Comstock.
2. The Butterfly Book, Holland.
3. The Moth Book, Holland.
4. Our Insect Friends and Enemies, J. B. Smith.

GEOLOGY

1. Geology of Illinois.
2. Geology of Indiana.

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3. Science Primer-Geology, Geike.
4. The Story of a Piece of Coal, Martin.
5. Rocks and Minerals, Fairbanks.
6. Pleistocene Features and Deposits of the Chicago Area—Glacial Epoch, by Leverett.
7. Appleton's Physical Geography.

MAGAZINES AND PAPERS

1. National Geographic Magazine.
2. Nature-Study Review.
3. Garden Magazine.
4. Fruit Grower and Farmer.
5. Farm and Fireside.
6. Country Gentleman.
7. Farm Journal.
8. Reliable Poultry Journal.
9. Irrigation Age.
10. Inland Poultry Journal.
11. Birds and Nature.
12. American Poultry Journal.
13. Western Poultry Journal.
14. Poultry Advocate.
15. Poultry Year Books, 1913–1914.

BULLETINS

A full set of Farmers' Bulletins from the United States Department of Agriculture. Among those that we find particularly useful are the following:

218 The School Garden.
468 Forestry in Nature-Study.
252 Special bulletin issued by the experiment station. Some types of Children's Garden Work, Miss Susan Sipe.
134 Tree Planting on Rural School Grounds.
181 Pruning.
113 The Apple and How to Grow It.
255 The Home Vegetable Garden.
173 A Primer of Forestry, Part 1.
358 A Primer of Forestry, Part 2.
41 Fowls—Care and Feeding.
51 Standard Varieties of Chickens.
154 The Home Fruit Garden.
185 Beautifying the Home Grounds.
99 Three Insect Enemies of Shade Trees.
195 Annual Flowering Plants.
208 Varieties of Fruits Recommended for Planting.
54 Some Common Birds.
127 Important Insecticides.
243 Fungicides and Their Use in Preventing Diseases of Fruits.

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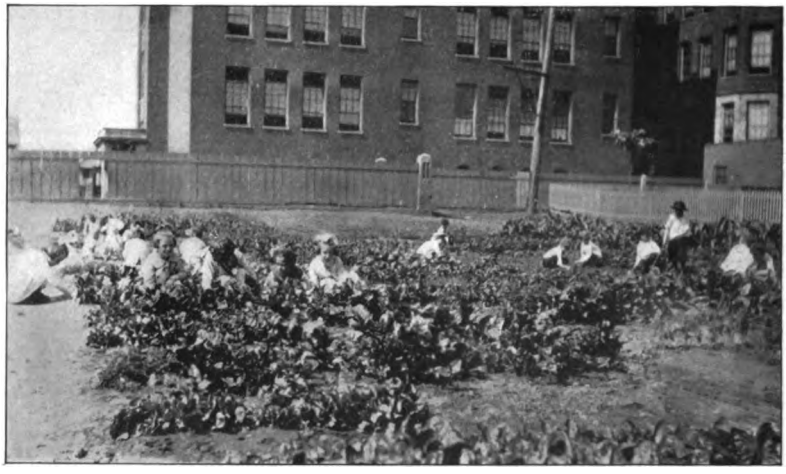
Government bulletins on Irrigation. Reclamation Department. They describe all the irrigation projects of the government. Federal Building, Chicago.

Bulletins on Drainage. Drainage Department. Describe all government drainage projects. Dept. of Agriculture.

Bulletins and Maps on Forestry and Conservation Areas. Describe and show on large maps the various government and state forests and conservation areas. Procured from Forestry Department, Dept. of Agriculture.



Van Vlissingen School Gardens

We also received many publications from our Experiment Station at the University of Illinois, at Urbana. Those that were especially valuable to us are the following:

1. Beautification of school grounds.
2. Description of Collection of Lepidoptera (Moths and Butterflies) of Illinois, to be given to Illinois high schools.
3. History of the Tussock Moth.
4. Bordeaux mixture for destructive blights and molds.
5. Spraying for destructive insects.

The Illinois Farmers' Institute of Springfield.

Bulletin No. 4. Destructive Garden Insects of Illinois. (A very valuable bulletin).

Small Parks Commission of Chicago.

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RED-HEADED WOODPECKER

Order—PICI
Family—PICIDÆ
Genus—MELANERPES
Species—ERYTHROCEPHALUS

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1. The Proper Trees for Chicago and How to Plant Them, by City Forester Prost.

2. City Ordinance Relating to Duties of City Forester, and care of trees (very helpful).

3. Home gardens, including Flowers and Shrubs. By Forester Prost.

In addition to these bulletins we received a number from nearly every state in the Union. Those that were especially helpful came from the experiment stations of Massachusetts, New York, Pennsylvania, Ohio, and Cornell University.

When the twelve-room addition to our school was made six years ago, the school yards were paved with brick, with the exception of a strip from four to five feet wide near the fences. This strip was filled with black earth that we might have a flower garden. There were wide spaces for flowers, shrubs, and vines at the sides of the building, and there was a narrow lawn in front. The space was divided among the thirty or more rooms in such a manner that the boys and girls had a separate plot to care for. They prepared the soil and planted the seed, flowers, and vines with reference to a definite landscape-plan, giving attention to form, color, height, time of blooming, etc. The pupils took turns in caring for them. They also learned how to care for trees and shrubs, and which were the best for different conditions of soil and care.

After we received our large, three- or four-inch trees, the pupils pruned the branches and bruised roots, and planted the trees in the holes prepared beforehand. They treated shrubs similarly. We have the following shrubs and vines:

SHRUBS

Bridle-wreath spirea	Bush-honeysuckle
Double-flowering almond	Mock orange
Rose of Sharon	Purple-leaf plum
Barberry	Flowering currant
Sweet shrub	Roses
Japanese quince	Snowball
Golden Bell	Snowberry
Japanese lilacs and the common lilac	Weigela

VINES

Boston ivy	Clematis
Virginia creeper	Bitter sweet
Wild grape	Morning glory
Trumpet creeper	Wild cucumber

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As a part of the care of the plants, the pupils inspected them and controlled the insects that began to prey upon them. The remedies used are indicated in the course listed above. We secured our supplies either from the large dealers in the center of the city or from local florists who ordered what we desired. The pupils of the eighth grade made kerosene emulsion and used it both at school and at home.

The pupils also scoured the whole district for destructive insects. During 1910 they captured over 6,000 tussock moths, or their egg masses. Since that time we have been unable within the radius of a mile to secure enough specimens for study. That year also they gathered over 25,000 other moths and caterpillars, and there has been a remarkable diminution in the number of such pests in our neighborhood since. As Dr. Forbes, the state entomologist, wrote me, if all the schools would do as much of this work in proportion, the insect-problem would be solved. The tussock moth is very abundant in Chicago, even in the crowded districts.

We have a large hand-sprayer, Brown's Auto Spray, No. 1. It works by compressed air and throws a spray of ten feet; with the extension rod we can reach twenty feet. The boys also use the small hand sprayers, and even made some which work fairly well. One boy who had learned to make kerosene emulsion went to fifteen neighbors and showed them how to kill the cottony scale by tying a bunch of rags around the end of a stick, saturating it with kerosene emulsion, and scrubbing the trunks and lower branches of the tree with it, thus killing this dangerous whitish scale, which is found on the under side of the branches of the soft maple and box elder especially, though also found on many soft woods, and occasionally on the elm, hard maple, and other hard woods.

We also tried the fertilizing of soil by the use of nitrifying bacteria, secured from the United States Department of Agriculture. We find that the plants of the pea and bean family grow much better after the addition of these nitrifying bacteria to the soil; but a soil that already possesses the germs in abundance is not benefitted by the addition of more.

The pupils also take great pleasure in preparing cuttings, both hard and soft, and planting them. They do considerable of this in the fall and spring, using pieces that have been discarded

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in pruning, but taking care not to prune lilacs and other very early flowering shrubs in the spring, as the flower buds are all ready to bloom then. They try to carry out this same work at home; so it has proven of great value.

Summer before last two adjoining lots were bought by the board of education and added to the school property. The large one, one hundred twenty feet square, is just south of the boys' yard; the other, thirty by one hundred feet, adjoins the

A Part of Van Vlissingen School Garden

girls' yard on the east. Teachers and pupils were eager to make school gardens here and raise vegetables as well as flowers. Some of the primary teachers wished also to raise grains and other crops, as illustrative material for the children. The ground in the larger addition was in a very bad condition. Much of the black earth had been stolen, leaving in many places the tough blue clay and growths of weeds. Ashes and rubbish covered the ground.

The boys took hold of the work of improving the plot, and there was great enthusiasm. They cut down the weeds and got the garbage man to take all the refuse away. The smaller plot was in worse condition than the larger, for it had been used as a dumping ground for years. Ridges of clay from basements alternated with piles of garbage, tin cans, broken iron, brick, glass, and tiling. Unserviceable material was removed, but the ashes were mixed with the clay. After back-breaking work the

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boys succeeded in leveling the lot at the back, so that it formed a terrace about three feet higher than the front.

After we had done what we could, we petitioned the board of education for help in grading and supplying black soil. Both in the educational and business departments our plans met with approval; water plugs were installed and tools for taking care of the grounds were supplied.

The large garden was divided into twenty-five plots, each garden being twenty-four feet square, before the paths were deducted. The squares were divided into smaller beds when the teachers saw fit. In the smaller lot we laid out five plots, ten by thirty feet in the low part; and on the terrace, we planted tomatoes and sweet corn.

When each room had planted what it desired, we had, in addition to some flowers, the following variety of vegetables and grains:

Radish	Beets	Rhubarb
Lettuce	Spinach	Strawberries
Cabbage	Peas	Melons
Tomatoes	Beans	Cucumbers
Onions	Lima beans	Potatoes
Carrots	Summer squash	Wheat
Parsnips	Kale	Oats
Parsley	Brussels sprouts	Barley
Swiss chard	Turnips	Flax
Sweet corn	Pumpkins	

The pupils showed great interest in this work, both boys and girls taking an active part in caring for the garden. When the lettuce and radishes were ready to eat, the children were eager to sell them, realizing the practical value of this work. It was a regular business transaction; they looked upon it as such. The work called for thought in planning, exactness in making things tally, and diligence in "keeping on the job." We found the reflex influence on the school work good. Boys of the motor type showed the most improvement, and many of the girls did excellent work.

Some of the larger boys had worked on truck farms in the neighborhood, and were thus able to give the younger children instruction in how best to weed and care for the plants. Several teachers' meetings were held at which we discussed the best way of handling this work. This practical training in applied botany has been very helpful to teachers and pupils.

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When summer came our troubles began. We had been allowing the pupils ten per cent. commission on their sales, though a number of children would not take the reward of their work, as they wished all the money to go to the rooms. The teacher acted as treasurer, if a pupil was not elected to serve. Each teacher appointed a committee to care for her garden during the vacation, to water and weed it, and sell the crop. The teachers looked after things in this way; and they had the assistance of two young ladies from the Home and Community Garden Club of the Chicago Normal College. I wish to acknowledge the good work Misses Olson and Johnson have done and to thank them for their kindness. For two weeks every one concerned was at work, but soon they began to scatter for the summer, or in the case of the pupils to find work and drop out of the garden work. Finally we had to offer a commission of twenty-five per-cent. and that brought better results. We had two "weeding bees" of teachers and pupils. The young ladies who were assisting did faithful work, coming two and three times a week to help and to direct sales. The school engineer, Mr. Vail, and his assistant did some weeding and watering too.

When school opened in September we found much to encourage us as well as to discourage. The larger lot already mentioned was on a busy corner; yet there was not so much stolen or destroyed as we feared would be the case. Radishes and lettuce suffered most. The smaller lot had been fenced in by our boys by means of strips of wood and chicken wire sent out by the board of education. We found that some teachers had succeeded in raising two crops of radishes and of lettuce; and one teacher raised a third crop by planting after school began, the long autumn favoring that venture.

Our total receipts amounted to thirty-two dollars, and we spent four dollars for seeds, plants and commissions. Thus we had a sum of twenty-eight dollars to divide among the different rooms. We had used seed for the most part which we received from Washington, D. C. For the reason that we worked in competition with professional gardeners in the neighborhood, it was not possible to sell everthing at times. Yet in many cases the housekeepers seemed to prefer our goods, and we could have sold more of certain kinds had we been able to raise more.

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In the coming year we shall plant more sweet corn, and we shall have a more scientific plan of taking care of the gardens during the summer. We shall pay some attention to poultry. There are a number of poultry fanciers in our neighborhood who will be glad to aid us.

I have not mentioned the flowers. Many flowers were raised under the supervision of the teachers, and there were many window boxes maintained. Every room and landing is beautifully decorated with plants, though we lost some through failing to protect them during a cold snap. We are putting out over six hundred tulips of the Keizerkroon type.

Nature-study, when properly taught, is one of the most valuable studies in school. It cultivates habits of industry, observation, and reasoning, and it develops the love of the beautiful. In many cases the children have carried home the ideas they have gained at school and have assisted their parents to improve their vegetables, flowers, and lawns.

Record of money earned by the pupils outside of school hours from July 1, 1913, to July 1st, 1914:

	Boys	*Girls*	*Total*
Gardening and Farming	$2168.76	$ 32.35	$2201.11
Store	1416.13	5.25	1421.38
Newspapers	1385.36		1385.36
Peddling	607.27	3. 60	610.87
Golf—Caddying	586.15		586.15
Chores and Housework	111.78	433.69	545.47
Errands	172.48	131.94	304.42
Janitor	257.45		257.45
Good Lessons	34.35	34.26	68.61
Teaching English	4.89		4.89
Miscellaneous	614.66	80.30	694.96
	$7359.28	$721.39	$8080.67

Of this money, over $4000 was given to the parents; about $1800 put into the bank in their own names; over $1000 expended for clothing, and remainder spent for furniture, presents, music lessons, bicycles, cameras, electric machines, outings and for other purposes.

Thirty dollars net received from the Van Vlissingen School Garden from May 1st to July 1st, 1914.

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About ten dollars received since Sept. 1, making a total of $40.00 less ten dollars for hiring workers during the summer, leaves about $30.00 net gain.

A large boy took charge of the garden during the summer. He received the profits and hired helpers.

The above record shows the amount of money earned outside of school hours by my pupils from July 1, 1913 to July 1, 1914. They worked on Saturdays, vacations, before and after school. They are learning to use their extra time profitably, to save their money, and become self-supporting.

Workers in Van Vlissingen School Garden

[A part of the above article first appeared in the *Educational Bi-Monthly*.]

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To a Morning-Glory

Found blooming on the grave of John Gore, my favorite teacher*

Dear little waif from the fields astray;
Why hast thou chosen his couch of clay?
And wandered here alone,
To trail thy slender stem with grace
Across the sod in this shadowy place,
To lift one flower lit with heaven's own blue
In honor of him whose heart was true
And kind to every one.

Yonder thy kindred amid the corn
Lustily climb over weed and thorn:
Here thou art scantily fed.
Strangely thy scalloped leaves appear
Under the spreading maples here.
Wouldst thou be with him this dewy morn?
He loved thee as well as the corn.
God made both, he said.

Silent his school-room long has been,
But its sounds are revived in the chatter and din
Of the grackles in the trees.
Erased are the colors he put on the wall,
But here in thy chalice are tints that recall
The crayons he used, and the trumpets he drew,
And all of the simple devices he knew
How to mingle with A B C's.

Didst thou follow him unto the tomb,
Brighten his bed with thy one little bloom,
And at his feet recline?
His was an eye that was eager to see
Signs of capacity in you or me;
Doubtings and obstacles he would remove;
He liked the venturesome; he would approve
Persistence such as thine.

Dear little waif, I love thee too,
Thy clinging form and thy flower blue,
And greet thee here to-day.
I love thee for bringing such beauty and grace
On a quiet morn to this somber place;
For cheerfully taking what heaven bestows,
And making the best of the day as it goes,
And smiling the gloom away.

JAMES G. NEEDHAM.

*On Sunday morning, August 13th, in Walnut Ridge Cemetery at Virginia, Illinois.

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Elementary Agriculture

A. W. NOLAN

Some Points to Emphasize in Teaching Farm Animals

One result of the teaching of the elements of Agriculture more or less widely through the public schools of our country, ought to be an increase in live-stock production on the farm. Since the decline of the live-stock industry on the western ranges, and the increase of farm tenantry, live-stock production has gone down about eight per cent. in the last decade. It would seem that the only way to assure an adequate production of farm animals and their products would be for the farmers to go into the live-stock business.

Aside from the question of public good resulting from increased production, the individual farmer would profit as well. Live-stock farmers are generally more prosperous than grain farmers. The reason is not far to seek. Farm animals nearly always sell at good prices; they enable the farmer to convert his crops into higher priced products; they utilize a great deal of waste material, and they contribute toward the maintenance of permanent soil fertility.

While teaching the value of live-stock on the farm, place the emphasis on pure-bred live-stock rather than on grades or scrubs. Pure-bred stock of all kinds sells for more money, gives greater and better returns in products upon the same or less feed, and adds no small amount of pride to the farmer's business.

This last is no mean asset to the success of farm life. When the farmer begins to get interested in any line of pure-bred live stock, when he sees an increase in quality and amount of the products, and when his sales bring him more actual cash, then he begins to improve his place, his home is better equipped, he will perhaps name his farm, advertise its goods, and the whole life of the family is elevated by the pride and skill which has grown up in his new interests. The teacher of agriculture may perhaps successfully encourage the boys in the class to begin at home the production and care of some line of pure-bred stock.

In the teaching of farm animals in public school classes, emphasis should be placed upon the improvement needed *here*, and *now*, in the live-stock upon the home farms, utilizing only those principles and methods which are well known and successfully established

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in economic practice. In studying the horse, for example, we should ask the question, and teach the answer—"What principles and practices are needed *most now* and *here* in order to bring about direct improvement in the farm work horses?" One need may here be discussed briefly to illustrate the point. What is the common menu of the average farm work horse? Unless the writer is badly mistaken, it is corn and timothy hay, three times a day.

Now this is not a well balanced ration for a working horse, and

A Boy's Poultry Project

the monotony of it, would disgust both beast and man. The animal husbandry specialists tell us that both timothy hay and corn have too much carbo-hydrate food in proportion to protein food to make the proper balance to keep a work horse in good condition. By the addition of cotton-seed meal, oats, alfalfa, and other foods richer in protein, a proper balance is restored, the horse enjoys his meals better, and he comes through the work season in better flesh and condition. There is no reason why the teaching of elementary agriculture should not lead to this improvement, along with others in this connection which will not be discussed at this time.

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What is the greatest present need in the improvement of the dairy cow? What ever else may be said, it must be clear to a student observer, that our cows should produce enough milk and butter to pay for their keep. Dairymen say that a cow should produce at least six times her weight in milk, or three or four hundred pounds of butter-fat a year to be profitable. How is this to be ascertained? Evidently by keeping records. Here is a practical task for the school boy in the study of elementary agriculture. It is an easy step to study the application of the elementary laws of breeding in the improvement and selection of the dairy cow in order to bring about profitable production.

How can we improve the farm hen? What is the improvement most needed? The latter is the easier question to answer. We want hens that will lay over one hundred eggs a year, and that too in the winter season when eggs are scarcest. This is partly to be achieved by proper feeding, but mostly by proper selection and breeding. If a hen has the habit by accident, or from selected strain to lay the maximum amount of eggs at the best season of the year, this fact should be known of each individual, and this can only be done by trap-nesting or by some other means of noting the record of each fowl. Here again is a practical piece of work for the student of elementary agriculture in improving farm poultry.

We might multiply instance after instance in the case of these and other farm animals wherein the boys and girls in the study of elementary agriculture may work out practical and profitable ways of improving farm animals along lines most needed upon the farms of our country. But sufficient has been given to open the way for a few months' work given in an elementary course. The work with farm animals may be conveniently done during the winter months, and with special interest at this season, because the farmer is chiefly concerned at this time with the sheltering, feeding and general care of his farm animals.

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An Experiment in Arousing Interest in the Stars

MARGARET W. AHERNE

In Gary, Indiana, the children have what is known as an Auditorium Period every day. In the larger schools eight classes with their teachers assemble in the auditorium during the period. It lasts one hour. During the hour the children have singing for fifteen minutes under the direction of a special music teacher. The rest of the time is taken up by the other teachers, each teacher having charge of the auditorium period in turn.

The aim of the period is to develop the child, so each teacher endeavors to have the children in her classes entertain the other classes present.

During the month of February my individual classes studied the stars. As the children in my four classes were in the first and second grades the instruction about the stars must needs be very elementary. Then the children were foreigners and the little ones were trying to learn the language as well as to learn about the stars.

The first constellation we studied was the Big Dipper. In order to show the children the meaning of the word dipper I borrowed a dipper from the Domestic Science Department. Then we studied the Little Dipper and the Pole Star. The second grade children also studied the constellation Orion and Queen Cassiopeia's Chair. After we had studied about the stars I asked the children of the oldest class if they would like to "act out" the constellations in the auditorium for the benefit of the children who were not having nature-study at that time. They enthusiastically answered, "Yes."

Before we went to the auditoriun I selected seven children to act as stars for the Big Dipper, seven for the Little Dipper, twelve for Orion, and five for Queen Cassiopeia's Chair. Each child had a large gold star. The stars were made of cardboard over which gold paper was pasted. While the children were acting out these constellations the stage was brightly lighted and the rest of the auditorium was in darkness.

In the auditorium the children arranged themselves in the form of the Little Dipper, the Big Dipper and Queen Cassiopeia's Chair in the positions in the sky in which these constellations are in February. The three children representing the handle of the

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Big Dipper said as they raised their stars above their heads, "We are the stars in the handle of the Big Dipper;" the four children representing the bowl of the Big Dipper said, "We are the stars in the bowl of the Big Dipper," then the seven children said, "We are the stars of the Big Dipper."

Then the children representing the stars of the Little Dipper told about themselves. The child representing the North Star held a gold star twice as large as the others. She then said, "I am called the North Star or the star that never moves." She then told in her own words the Indian legend about the North Star. Then the children representing the stars in Queen Cassiopeia's Chair said, "We are the stars in the Queen's chair."

These three sets of children left the stage and were replaced by twelve children representing the stars in the constellation Orion. They all raised their stars above their heads and said, "Orion was a mighty hunter." The children all lowered their stars and the two representing Betelgeuze and the star nearly opposite raised their stars above their heads and said, "We are the stars in the shoulders of Orion." Then the three children representing the stars in the belt of Orion said, "We are the stars in the belt of Orion," the children representing the stars in the sword of Orion said, "We are the stars in the sword of Orion;" then the boy representing the star in the heel of Orion said, "I am the star in the heel of Orion." With upraised stars the twelve children repeated, "Orion was a mighty hunter."

Shortly after this review a number of the youngest children were promoted and they ceased coming to me. While walking through the hall several months later I was stopped by a little girl named Camella who looked up shyly and said, "I saw the Big Dish in the sky last night." I was greatly encouraged because I knew that if Camella remembered that much the other children would remember more.

A Leaf Project

ESTHER CRAIGMILE

Instead of aimlessly enjoying the variously tinted autumn leaves which were brought into the school room by seventh grade pupils it was suggested that the room divide itself into committees to prepare leaf charts representing the various tree families in the region about La Grange. The work was undertaken with unusual

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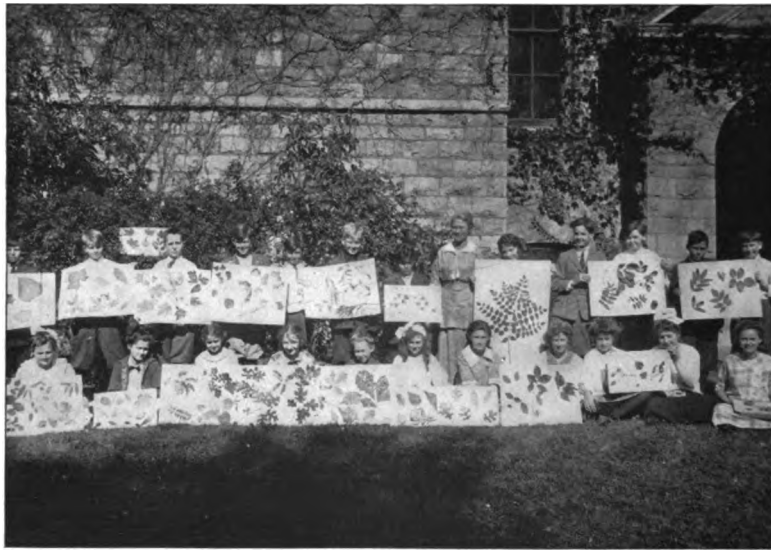
enthusiasm and in two weeks the charts were ready to be displayed. Friends were invited in to see the exhibit and the boys and girls told where the specimens were secured as well as something about the trees.

The maples included the box elder, hard maple, soft maple, cut leaved maple, the Norway and Schwedleri.

One oak chart represented the white group with rounded leaf edges viz., white, swamp white and burr; while the other with



The Leaf Exhibit

darker bark and sharply pointed leaves consisted of black, shingle, chestnut red and scarlet. Several pin oaks have since been located. The scarcity of acorns and the presence of hybrids made the study of oaks rather difficult this fall.

The white and paper birch made an attractive display, the latter with the catkins.

The willow family was divided into willow and poplar groups. Specimens from the white, weeping, Pussy, long leafed and slender leafed willows were procured. Black should have been included to be sure. Mr. Sanford, the superintendent, gave a most instructive talk to the audience on the identification of this puzzling group. Those who heard it begin to be on speaking terms with willows now.

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Lombardy, Carolina, silver leaf poplars, with the quaking aspen and deep toothed aspen made the rest of this group.

The ash chart only showed black white and blue. Red and green might have been provided had the two boys labored as did the three girls on the oak committee.

Hickory, walnut, butternut, and bitternut leaves and fruit made up this group. A more energetic committee would have also secured pignut.

Fruits were well represented by wild and tame varieties. These belonged to the rose and mulberry families. Osage orange was grouped with the mulberries.

Leaf clusters in no sense did justice to the elm family including the American or white, cork, slippery and hackberry.

Locusts, black and honey, with redbud and coffee tree composed another group. To this was added Hercules' Club so that the three doubly compound leaves were all exhibited.

Two miscellaneous charts were needed for unclassified groups. These included mountain ash and oak leafed mountain ash, tulip, catalpa, gingko, horse chestnut, linden, sycamore and magnolia. Pawpaw and hornbeam might have been added.

Leaves were dipped in parafine or pressed before mounting. Specimens were glued or sewed on securely so the charts are durable. Already other grades have borrowed or consulted the collection.

No attempt was made to classify the trees which were not deciduous. A rival seventh grade is already making plans to classify the evergreen trees.

Twenty-five Thousand Dollars to Aid Teachers in Bird-Study

T. GILBERT PEARSON

Last year the pupils engaged in the Junior Audubon Classes numbered more than 115,000, and represented every State in the Union and some of the distant territories, as Alaska, Hawaii, and Porto Rico, and many Canadian Provinces. The plan and method of the Association are as follows: Any teacher or other person who pleases may form a Junior Audubon Class, of ten pupils or

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more. Each of these members is required to pay a fee of ten cents. The teacher will then send these fees to the National Association, of Audubon Societies, in New York, giving the name of the Class and his or her own name and address; or in some circumstances the fees are sent to a State Society.

The Association or State Society will then forward to the teachers for each member whose fee has been paid, a beautiful Audubon button, and a set of ten colored pictures of birds (see frontispiece, this number), the list of which is changed every year, and with them will go outline drawings, suitable for coloring by the children, and descriptive leaflets. The teacher reporting the class will also receive, free of cost, for one year, the finely illustrated magazine *Bird-Lore*, which contains many valuable suggestions for teachers. Should the class then, or subsequently, be enlarged, a button and a set of leaflets will be added for each new member until the end of the school year. In return, it is expected that the teacher shall give at least one lesson a month on the subject of birds, and that the leaflets shall serve as a basis for the lessons, but experience shows that usually much more than this is done.

Full information as to the details of this plan, and a simple form of organization for a Class, may be had by addressing a request to the National Association. The list of ten birds to be studied this year includes the brown thrasher, nuthatch, bluebird, downy woodpecker, Baltimore oriole, robin, bobolink, goldfinch, song sparrow and green heron.

The Leaflets which are supplied to the children have been prepared with extreme care, to insure not only scientific accuracy but correct and graceful diction adapted to juvenile understanding, so that they may be available as reading-lessons, and as safe models to follow in English composition.

Teachers reading this notice, and desiring to take advantage of this offer, may collect and send in their children's fees at once, and receive the material promptly; or further printed information will be furnished upon request sent to the Secretary of the Association, at 1974 Broadway, New York City.

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Book Reviews for January

The Germ Cycle in Animals. Robert W. Hagner. Pp. x+346. The MacMillan Co. $1.75.

Ever since Weismann so forcibly championed the theory of the continuity of the germ plasm and pointed out how his theory undermined the basis of such theories regarding the method of evolution as those of Darwin and Lamarck, biologists have been keen for any presentation of new facts, regarding the germ plasm or discussion of the data already known. This book of Hagner's is largely a systematic presentation of the data now in hand regarding early differentiation and the life cycle of the germ cells. The introductory chapters, one and two, are a brief résumé of the cell theory especially as it applies to the germ cells. Chapter 3 is on the germ cell cycle in the fly, Miastor, in which the germ cells are differentiated very early and are easily recognized throughout the life history. Chapters 4 to 7 inclusive collect the facts regarding early differentiation and the continued recognition of the germ cells in the several animal subkingdoms. Chapters 8 and 9 discuss the significance of various constituents recognizable in the germ cells. Chapter 10 is on the germ plasm theory. There then follow some twenty-six pages of bibliography.

The book is one that will be welcome by all students of biology and by those general readers who wish to keep up to date on biological fact and theory. The book is clearly written, so that even one who is not an expert in cell studies may understand readily the progress that is being made.

Elements of Forestry. F. F. Moon and N. C. Brown. Pp. xvii + 392. John Wiley & Sons. $2.00.

This is an exceedingly good book on forestry—the best that has yet come to the attention of the reviewer. In the opening chapter the authors show the relation between forestry and tree culture and its importance to lumbering. Contrast is made between forestry conditions in this country and those in Europe. The remainder of Part I, consisting of fourteen chapters, is devoted to the various phases of forestry, study of the tree, systems of management, rejuvenation, forestry mensuration, lumbering, wood utilization and preservation, the finance of the forest. Part II, of eight additional chapters and appendix, describes the various forest regions

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of the United States, defines their limits, and gives brief descriptions of the characteristic trees.

The book is abundantly illustrated with excellent pictures practically all of which appear for the first time. The book is very readable, for the style is simple and the person with only casual interest in our forests will enjoy the book. It presents one of our great national problems in a very attractive way.

The Book of Monsters. David and Marian Fairchild. 266 pp. National Geographic Society.

This is a book of pictures with a page or so of descriptive text accompanying each plate. The monsters are the spiders and insects of our back yard, but the pictures are taken with a very long focus camera, so that a very great enlargement has been achieved; familiar friends are portrayed in gigantic proportions that are almost alarming. The pictures show up the details in a surprising way; the mouth parts on flies and beetles are given with almost diagrammatic distinctness: one can hardly realize that the picture is an actual photograph. The picture of the wolf spider shows the fangs and the eyes as if seen under a microscope. The king grasshopper on page 54 is a startling revelation. The photograph of the hearing organs of the grasshopper on page 64 gives detail with great distinctness; similar organs are shown in the katy-did on page 68. The dragonfly feeding on a fly, shown on page 194, is exceedingly good as are also the two following illustrations of the nymph showing the mask. Anyone who has undertaken insect photography will realize what a degree of patience and skill has gone into the making of this book. It certainly is a book that will go into the nature library of the child revealing many wonderful things in familiar animals. The pictures are as strange and uncanny as the monsters drawn from the fertile imagination of the writer of fairy tales. Very little text accompanies the pictures. Just enough to tell briefly of the animal photographed

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The February number is to be a Special School Garden Number. The March number will be devoted to the outline of nature-study in use in the Mankato (Minn.) Normal School. The April number will be a Bird Number. More than 300 copies of the special organization number, December, have been sent out on extra orders. If you want extra copies of these special numbers order early.

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DEAN L. H. BAILEY,
President-Elect of the American Nature-Study Society.

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MRS. ANNA BOTSFORD COMSTOCK,
Retiring President of the American Nature-Study Society.

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THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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VOL. 11 FEBRUARY, 1915 No. 2

Children's Home Gardens

ALICE JEAN PATTERSON

We have for a number of years in our Normal School made gardening an important part of our nature-study program. We have a school garden in which each grade of the training school, as well as the nature-study classes of the Normal Department, has its own plot for vegetables, flowering plants, and in some cases, farm crops. Each grade has its own social problems in plant propagation, cultivation, etc. In short, the school garden is used largely as a laboratory for practicing the principles of gardening and for carrying on simple experiments.

One purpose of the garden work in the Training School is to encourage the children to carry gardening over into their homes. We have met with more or less success in this. However, we have felt that closer supervision would lead to more permanent results. We have in our town an Improvement League of women who for a number of years have tried to interest the children of the town in growing plants. Their main work has been to distribute aster seeds to all children of both public and training schools. This was followed by an aster show in the fall with prizes for the best display. There were many reasons why this plan was not altogether satisfactory. In the light of the above facts, it seemed as if the time were ripe for the two forces to combine and make the garden serve somewhat as a civic affair. Accordingly a tentative plan for carrying this out was presented to the Improvement League, and to the Principals of the schools. The proposal met with approval. Its main features are discussed below.

All the school children of the town were eligible to membership in a Children's Garden Club. Each grade constituted a branch

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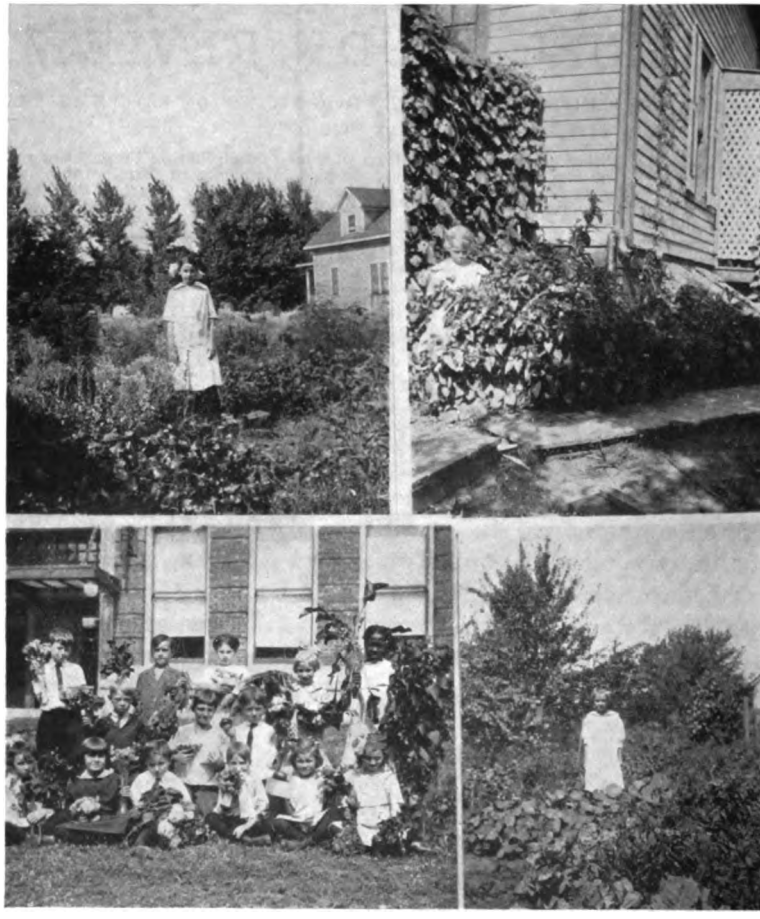

Upper Left. A seventh grade girl interested in beautifying the home grounds.
Upper Right. A second grade child and her morning glories.
Lower Left. Third grade children with their products for the exhibit.
Lower Right. A fourth grade girl and her nasturtiums.

club with power to elect committees for special work, or delegates to represent the branch at any meeting of the entire club. The directors of the club included the teachers, the garden committee of the Improvement League, and the teacher of Nature-Study in the Normal School.

Membership in the club was voluntary. The conditions were—
1. Each child who became a member must have a garden of his

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own. 2. He must be willing to have his garden visited by a garden visitor.

The plan was proposed to the children early in March with the result that two hundred and sixty-four became members of the club. A portion of the nature-study period was taken in the school for the purpose of discussing the home gardens; how to prepare the seed bed; what to plant, how and when to plant. A list of seeds that were likely to give good results were submitted to the children. However, their choice was not limited to these. Each child had the privilege of planting either a vegetable garden, a flower garden, or both. The children purchased their own seeds. Those below the seventh grade ordered theirs through the Nature-Study Department of the School. The upper grades sent for seed catalogues and ordered their own seeds.

The chief visitors of the gardens were students who were taking the Home and School Garden course in the normal school. This course includes as a part of its work the observing and directing the children in the school garden, and visiting the home gardens. The other visitors were members of the garden committee of the League.

A card record of each garden was kept by the visitor. This showed the name of the owner of the garden, the plants grown, the care and arrangement, and the condition at the time of the visits. Below are shown data from two of the cards. The first belongs to a seventh grade boy, the second to fourth grade.

PLANTS	DATE OF VISITS	ARRANGEMENT—CONDITION
Radishes. Onions. Wax and lima beans. Cypress, Poppies. Mignonette, Candy-tuft, Marigold.	May 13.	This garden occupies a space equal to a small city lot. The arrangement of the flowers and vegetables is excellent. The flowers are placed according to height. The vegetables are in plots behind the flowers.
	July 1.	The garden is in excellent condition. It is well cultivated and free from weeds. The boy expects to defray part of his school expenses from the sale of his beans.

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Plants	Date of Visit	Arrangement—Condition
Lettuce	April 24.	Planted in rows. Everything in good condition. Rows straight and no weeds.
Radishes.		
Onions.		
Beets.		Garden in good condition. No weeds. Some of the radishes have been used on the table.
Cosmos.		
California poppy.	July 3.	

A sixth grade boy with his sweet corn and tomatoes.

The visitors were most enthusiastic over the interest shown by the children and their parents. After the students had completed their visits they handed in papers relating some of their experiences and their opinion of the work. I quote from a few of the papers:

"The children were proud of their work and seemed to look forward to my visits. The parents were also very much interested in the work of the children and were glad to tell me how the children had planted the seeds and what work they had done on their gardens. I found the work very enjoyable and am looking forward to the second visit."

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"The visits were made after school hours when the children were at home. If the garden were one in which most of the products would soon be used, it was suggested that the child replant with something else in order to have a succession of products."

"The parents and children seemed much interested everywhere I went. There were only two places that the mother did not come out to speak to me and listen to the suggestions I had to offer."

"One little girl had planted her garden on some waste land at the end of the family garden. Last year there had been no garden on this place; instead it had been overgrown with weeds. In spite of this the child's garden looked fairly well and she said with pride: 'I do not suppose that any one has tried to raise a garden here before'."

"I feel that the visiting of the gardens has been one of the most helpful phases of the course. The interest taken by the parents and the enthusiasm of the children have made me feel that nature-study and home gardening are greatly worth while."

"The visiting of home gardens as a part of the Home and School Garden course, I, at first, looked upon as a very unpleasant task. My success with this phase of the work seemed doubtful. Would the parents welcome such a visitor, and would the children be pleased to have a representative of the school garden class inspect their work, were the questions that made the work look formidable to me. In preparation for the visits I met the children in the schoolroom in order to get acquainted with them and explain the purpose of my visits which were to occur the next week. The children met me half way and seemed pleased that I was to visit them. After this interview my misgivings were somewhat relieved.

"With my first visit all my fears vanished. As soon as I arrived at the first home I was given a smile of welcome and the little gardener moved toward his garden with an air of pride and a sense of ownership seen only in interested children. The boy talked intelligently about his garden which was well arranged and in good condition.

"In conclusion, I wish to say that visiting home gardens is not a task but a pleasure trip, in which the student feels the companionship of live boys and girls who are intensely interested in the work they are doing."

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The above quotations were taken from the papers of visitors of the second, fourth, and seventh grades. All of the others showed the same interest in their work.

The climax of the garden work was reached in the celebration of Garden Day on September 25. The main feature of the day was a display of products grown by the children. Each child brought specimens of his vegetables, or flowers, or both. These were arranged according to grades in the large play room of the children. The display was really very creditable. Eight long tables were completely covered. There were twenty-four different kinds of vegetables, and about twenty flowering plants. The best diplay of each kind ot plant in each grade was given a blue ribbon, the next best a red ribbon, and all the rest a white ribbon. In this way every child received some recognition of the effort he had made.

Using the card records as a basis another grouping of the children was made. Class A—included those children whose card records showed excellent care or arrangement of their gardens. Class B—included children of second rank in care and arrangement. Class C—included all other children who had done something in gardening. Class D—children who had done special work in beautifying home grounds. All the lists were published in the little weekly paper of the town.

A second feature of Garden Day was a program: At the close of school all the children of the club, their teachers, parents and a few other invited guests gathered in the gymnasium where a program of much interest was given. The children themselves were the chief participants. Each branch club had elected one of its members to represent it. The children told in a most natural fashion their experiences in growing their plants. An eighth grade boy described all the steps taken in raising sweet corn from the breaking of the ground till the crop was harvested. A seventh grade girl said that while she had grown a number of plants she was going to tell us about the one that had interested her most. This was the castor bean, a plant she had never tried to grow before. She told of its rapid growth, the great height it had attained, its peculiar flowers, the beauty of the foliage, and how it might be used as a shrub to improve the appearance of the home grounds.

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A report from a fifth grade boy was unique in that he related some of his failures and what he hoped to accomplish another year in the light of his experience. A fourth grade girl told in detail how she had succeeded in raising half a bushel of peanuts.

A second grade boy said "I planted radishes, lettuce, and nasturtiums. Mamma had my radishes and lettuce for dinner one day. Only one of my nasturtiums grew and it did not have any flowers only leaves, but I pulled it up and brought it for the exhibit today."

At the close of the program the Improvement League took charge of the entertainment. The children were served with ice cream. This, the League believed a much better plan than offering prizes in which only a few children may participate.

Altogether the results of our experiment have been gratifying in the extreme. The pleasure and enthusiasm shown by the children, their goodfellowship and appreciation of each other's exhibits were evidence enough that our efforts had been worth while. Besides the direct value to the children, the plan has helped to bring about a closer bond of sympathy between home and school. At the same time it has aroused not a little civic pride on the part of both children and adults.

Vegetable Gardening for City Children

ETHEL GOWANS

In view of the importance of vegetable gardening for city children, Dr. P. P. Claxton, United States Commissioner of Education, has established a division, "Home and School Gardening," in the Bureau of Education. This is made possible by special appropriation by Congress.

Many of us have long realized that a large number of our cities could produce in their back yards, or vacant lots, all the vegetables needed for their people. There are also many children in these cities who would enjoy growing vegetables in such land if some one could be employed to direct the work.

To insure the greatest success, it would be necessary for the city board of education to employ a garden teacher for each school for twelve months. The children fail as gardeners when the problems of plant growth become so complex that interest is

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lost. To prevent this, the garden teacher visits each home garden at least once a week and directs the work. The plan really amounts to a twelve-months school: the back-yard is a class room; the growing plant is the text-book, with subject-matter adapted to the immediate mental and physical growth of the

Upper figure. Canning vegetables for future use teaches thrift and economy—Oregon.
Lower figure. By some cooperative methods, the surplus products may be marketed—Pittsburgh.

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child and presented in such a way that he enjoys the part he plays in the family and community welfare. When the back yards are not large enough to produce sufficient vegetables for the family use, the teacher will then secure land in vacant lots. Some cities having neither large back yards nor vacant lots, are considering plans for transporting the children to the suburbs.

This is not one of the 85% of children at home during vacation without any useful, healthful and productive occupation.

Photo by M. Louise Green

After the family has been supplied with vegetables, then the surplus should be marketed by some co-operative method, or canned. The possibilities of canning vegetables are continually increasing. The girls' canning clubs of the South have clearly shown what can be accomplished in the home canning when it is directed by experienced people.

To be a successful garden teacher one must become very familiar with such problems as soil management, moisture conservation, plant food requirements, vegetable rotation, seed selection, vegetable diseases and insect enemies, and their control, as well as the canning and marketing of vegetables. Personality is most

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important; the garden teacher must be sensitive to the feelings of others, for this work makes the teacher one of the family circle.

City superintendents are realizing keenly the value of this work. It is not uncommon to have a superintendent say that his town is

With proper cultivation and care there is no question as to what the harvest will be.

Photo by M. Louise Green

a mill town, or a railroad town, and the population is continually changing, but that if vegetable gardens were well-established in the back yards and attractive floral plantings in the front yards, the houses would then be homes, and people would remain. The people would not then only take more interest in their own lots, but a community spirit would soon be aroused that would stimulate a desire to better city conditions. To demonstrate the possi-

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bilities of vegetable growing in cities, a citizen in one of our southern cities loaned one of his vacant lots to a good gardener. This lot is to be a model back-yard garden. It will have some small fruits and a vegetable plot large enough to produce a yearly supply of vegetables for family use.

For the present, the teacher is the important factor. It cannot be emphasized too strongly that, unless we develop efficient teachers for home gardening, success will not be possible.

School and Home Gardening in Portland, Oregon, Season of 1914

By M. O. EVANS, JR.

Director and Supervisor, Seasons 1913–1914

The school and home garden work of the Portland Public Schools during the season of 1914, was much more extensive than during 1913, a report of which appeared in the NATURE-STUDY REVIEW for October. The work of the previous year, although not started until March 1, was so uniformly successful and productive of good results, that the Board of Education saw fit to take it over and finance it for the season of 1914. Probably no such extensive work in this line was ever conducted elsewhere at such a small cash outlay as in Portland during the past two years. In 1913 the total expenditures for 28 gardens covering 10 acres, amounted to a little less than $2,000.00 for a four months' season beginning March 1. In 1914 the total cost of 43 gardens covering 16 acres, was approximately $4,000.00 of which about $3,000.00 was furnished by the Board of Education, the balance being raised locally in several districts, mostly for fencing, seeds, ground preparation, etc.

The total registration for 1914 was 8,100 for the school gardens, and 3,500 for the home gardens. About 1,000 children having gardens both at home and at school left a total of 10,600 individuals actually participating in the work. This was 39 per cent of the total public school enrollment and 47 per cent of the grammar grades to which the work was largely confined. The total registration showed an increase of approximately 40 per cent over the previous year.

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Only lot available for Shattuck School Garden, Portland, Oregon.

(Note following cut showing same lot after gardening)

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Work was begun December 1 by the supervisor locating suitable pieces of ground and preparing them for use. Many of them were in heavy sod and required a great deal of work with the disc harrow, both before plowing and after. Two hundred and ninety-six loads of manure were hauled and spread upon the ground and sixteen tons of ground limestone was applied at the time of disking or final harrowing. Most of the manure and lime was spread by the boys themselves under the direction of the supervisor or their principal. In addition to the manure and lime, large quantities of wood ashes from the school furnaces were used in some places where the soil was especially heavy.

Planting was begun the last of March, but was greatly delayed by two weeks of showery weather. The planting of vegetables, except for second crop radishes, late potatoes, and cabbages, was completed May 5, although most of the work was accomplished during April. Considerable was done in the line of floral decoration, for although the contest is primarily a vegetable one, the planting of flower seeds and the setting of plants is encouraged. Nearly all of the school gardens, and many of the home gardens, had borders or beds of flowers in the corners, centers, or across the front, sides or rear. Several fences were covered with different sorts of climbing ivy, wild cucumber, nasturtiums, etc. In most cases, the land being borrowed from private owners and only available from year to year, very little could be done in the way of permanent decoration. Dependence had to be placed, for the most part, on nasturtiums and inexpensive plants. Many beautiful effects, especially school names, were worked out with loose leaf lettuce and beets and with English daisy plants.

The work this season took on more the character of regular school work than was formerly the case. In those schools where a majority participated, whole rooms were taken out for garden work, usually twice a week. In other schools where ground area was limited, or where the interest was not so great, most of the work was done outside of school hours, school time being given, however, as a reward for faithful work in the classroom. At many schools the amount of ground available for garden purposes is very limited and can only serve as a demonstration area where the pupils may learn how and why, in order to carry on operations at home on a larger scale. At a large number of schools, the gardens were large enough to provide every interested

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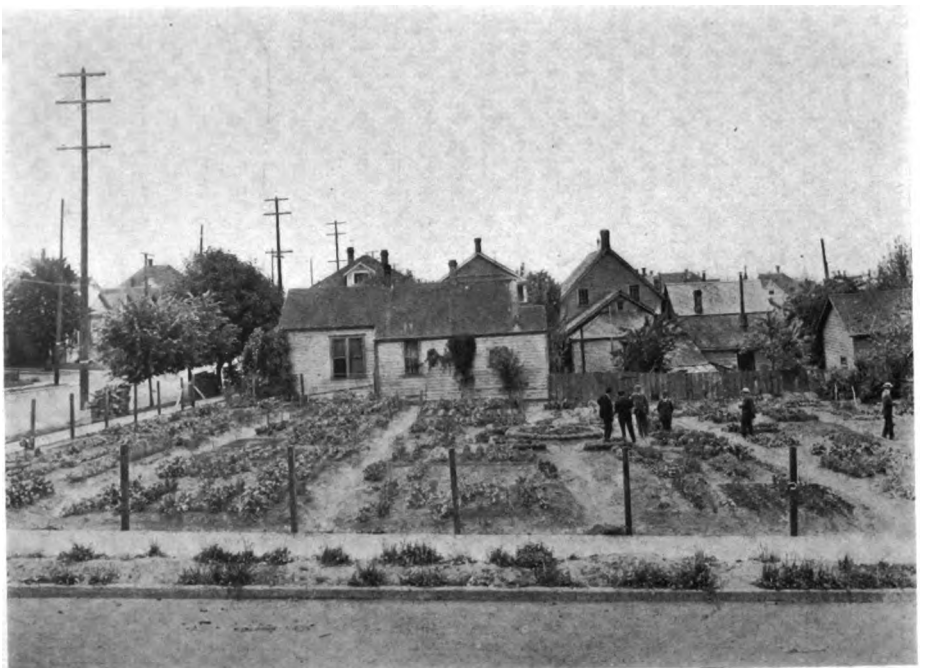

Shattuck School Garden. Area 100 x 110. Number of Gardeners, 160.

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pupil above the third grade with an individual plot varying in size from 40 to 108 square feet. Those below the fourth grade usually worked together by rooms. In several schools the number of interested children so far exceeded the area of ground available that every room had only a section and each pupil one or two rows.

No two gardens were laid out exactly alike. Every one had some distinguishing feature or arrangement, decoration or varieties of vegetables grown. The size varied from 30 x 40 feet to two acres, the average being about 15,000 square feet.

About two-thirds of the gardens were continued into the vacation period. This was the case especially in districts where most of the pupils spent their vacations at home. In those gardens later maturing vegetables, such as potatoes, beans, corn, popcorn, pumpkins, late cabbage, cauliflower, and tomatoes were planted, in addition to the early maturing vegetables. Committees of pupils were appointed by the principals before school closed. These committees met with the supervisor for garden work about twice a month. All neglected plots were taken in charge by the committees who, in return for their work, were entitled to the vegetables. The total value of the products grown in the school and home gardens, as nearly as can be ascertained, totalled at least $7,000.00 at market prices. The pupils actually sold about $400.00 worth to persons outside their own families. This was disposed of at the public markets and locally in the districts. Many parents stimulated youthful interest by purchasing their children's products at market prices. The marketing end was a very interesting and helpful feature of the work. The work for the season ended September 1.

Several gardens were departures from the ordinary type of school garden. For instance, the St. Stephen's School had a popcorn and pumpkin garden. This plot, covering an area of one-fifth of an acre, produced fourteen bushels of finely matured white rice popcorn, in spite of the fact that it was poor soil filled in when the streets were graded many years ago. These exceptional results were secured by the use of eight tons of manure, 400 pounds of ground limerock, a ton of wood ashes, and a very thorough preparation of the soil. The ground was plowed twice, being well disked before and after. Many pupils raised their own cabbage, cauliflower, and tomato plants at home, in the schoolrooms, or in small hotbeds or cold frames.

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One of the most interesting features of the work in Portland has been an inspection trip made the week before school closes. This party of inspection includes city and county officials, prominent educators, of the city and state, representatives of the Agricultural College, newspaper reporters and other interested persons. The whole day is given to the trip and as many gardens are visited as possible. At noon a fine luncheon is served by the domestic science department of some school, at which all the vegetables are products of the school gardens. The school gardens are divided into different classes and divisions on the basis of experience and size of the areas of ground cultivated. Ribbons only are awarded as prizes. Cash prizes are given by the Parent-Teachers' Circles for the best home gardens in the districts, and others for the best in the whole city.

The work in Portland is now on a firm basis and will be continued during 1915, under the supervision of Mr. A. E. Weed. A bulletin entitled, "School and Home Gardening for Elementary Schools in Oregon," compiled by the author of this article, has been issued by the Oregon Agricultural College as College Bulletin No. 176. This bulletin was issued for the purpose of stimulating interest in school gardening in the smaller cities and towns of Oregon. It contains a brief description of the various phases of school gardening and is illustrated with sixteen cuts and seven diagrams of plans for laying out different areas of ground. Copies of this bulletin may be had by addressing the writer of this article at Oregon Agricultural College, Corvallis, Oregon.

Beautifying Work as Nature-Study

MARGARET DOLAN

Effective use of the children in a general beautifying plan while they are students in the regular agricultural course in the public schools has been made in Los Angeles, California, and the close of the spring term will have demonstrated what degree of success has been achieved. The general activity on the part of the little folk was stimulated when, in the summer of 1914, a large committee of citizens was appointed to beautify the city and county for exposition year and to provide entertainment for a large number of conventions and visitors.

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Scores of blocks of homes like this come under the influences of the children engaged in city beautifying, Los Angeles, Cal.

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Flower planting by wholesale was suggested as the chief means of adding to the attractiveness of the community, and a brief investigation revealed that it was possible to reach thousands of families through the children that otherwise could not have been influenced to co-operate. The agricultural department of the schools, with a corps of sixty teachers, entered heartily into the plan. To arouse interest on the part of the children in planting and maintaining home gardens the committee offered individual prizes ranging from five to fifty dollars for the best year's work, and for the schools, the largest prize was $400.

The youthful gardeners joined heartily in the campaign. Nearly five thousand entered in competition for the best home gardens, in addition to the tens of thousands who took part in beautifying the school grounds and their homes without entering the contest for individual prizes.

A fall planting was proclaimed the Friday after Thanksgiving, when it was estimated ninety thousand children in the city and county actually were engaged in garden work. The agricultural department of the schools distributed seed enough to the children to plant five square feet of ground for every resident of the city, placing the population at 600,000. The climate of Southern California lends itself readily to winter gardening, as the rainfall usually begins in October and continues into May.

Five experts were employed by the committee to work with the agricultural teachers in supervising the home garden work, instructing the gardening classes and scoring the individual gardens. In the credits given due attention is paid to the condition of the ground before planting and other conditions, so that the pupil in easy circumstances might not enjoy any advantage over those whose facilities for garden making were limited. Photographic records also are kept of the home gardens. The final scoring will be done at the end of the spring term.

The effect of the home work proved to be far reaching. Brothers, fathers and neighbors became interested in "watching things grow." They also absorbed much information in the development of the little home gardeners' work, as pamphlets containing full instructions were distributed free to the children to take to their homes for guidance. From these the amateur adult gardener could learn the first principles of home beautification. The popularity of the home garden manual was such that an extra

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Boys at work in School Garden, that formerly was a dumping ground for the neighborhood, Los Angeles.

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edition of ten thousand was in demand soon after the first edition of twenty thousand appeared.

The teaching of agriculture has been a feature of the public schools for several years. It is the intention of the board of education to consider the economic side of this instruction; to introduce eventually instruction in raising animal food such as poultry and rabbits. The seventy-five school gardens in operation in the city have proved practicable in reducing the cost of living in hundreds of families. The products are sold to the pupils at nominal prices, the money thus derived being used in the purchase of seed and for the upkeep of the soil.

The city beautifying plan gave a tremendous impetus not only to flower planting in the homes of children but to vegetable growing in vacant ground, as the prizes include vegetable and flower gardens.

While the actual cultivation done by the children has been of tremendous economic value and has resulted in literally millions of blossoms where none existed, the most potent and far reaching effect of the movement is believed to be in the bringing near to nature of thousands of developing minds during their most impressionable period. The little gardeners in their zest to excel eagerly absorb all information on plants that is available. In turn they impart this to others. Part of their work is to demonstrate their own garden work, explaining to their fellows the technical part of what they have done and why. The love of growing things has been instilled deeply in most of the children taking part in the city beautiful plan. The idea of aiding in an enterprise of wide scope gave them pride in their work. When the first fruits of their labors were seen their activities increased correspondingly. Tender care is being lavished on struggling little plants that have been brought into the sunlight through the efforts of the caretaker who, in thousands of instances, is a child receiving its first lessons from Nature.

The children are taught of the insect enemies of flowers and vegetables and how to overcome them. With their own hands they are developing the best of Mother Earth and learning to love the beautiful and useful of her products.

In discussing the children's part in the City Beautiful movement, John H. Francis, superintendent of the city schools, said:

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"The actual planting of flowers and fruits, the attendant care and the final result in beautiful yards, streets and boulevards are second in importance, in my mind, to the most important results that will bring about far reaching development in the education of these young people. The school children of Los Angeles will receive benefits through this movement that will extend into the years to come.

"The efforts of the pupils and teachers must result in standards that will not tolerate many of the ugly and unsightly places now to be seen in American cities.

"Los Angeles is taking the lead in encouraging her school children to love the beautiful. I hope this movement will meet with tremendous success, not only in this city but throughout the United States."

Heuristic Method

L. C. McLEAN

The writer recently, when visiting the Provincial London, Ont., Normal School, accompanied a group of teachers-in-training with Professor J. Dearness in charge on an investigation trip to the school-garden. It may be said that from time to time during discussions in his class-room questions are asked and problems arise that are not disposed of then and there but are reserved for investigation either as practice in the heuristic method or illustrations of it. On this occasion the trip referred to was made to investigate three such questions, namely:

(1) Do the double Ten-Weeks Stocks produce any seed; if not how may they be propagated?

(2) What other methods of aggregating flowers than the one shown by the Composites are exhibited in the school-garden? This question had come up in a discussion of the advantages of the Composite inflorescence.

(3) How comes it that the door-yard knot-weed flourishes in much trodden situations?

(1) Examination by the students of a large number of single and double flowered stocks in the garden disclosed no example of fruiting double-flowering plants nor of sterile single ones. After warning against a dogmatic conclusion that double flowering stocks

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never produce seeds the students were set to examine the flowers of both kinds and to compare the number and arrangement of their floral parts and so, mayhap, to discover the cause of the sterility of the double flowers. In the latter neither anthers or pistils were found,—certainly no anthers. Then came the practical application in the attempt to answer the question—How may we from the material here, secure double flowering plants for next year's garden? The roots were examined to see whether root-division offered the answer. The class reached the conclusion that slipping would have to be resorted to; accordingly some slips were selected for trial. The teacher invited speculation as to how the first double flower may have been obtained and worked with the suggestion that it must have come accidentally—"a sport." What has happened once might happen again so it might be worth while to experiment with some of the single-flower seeds. Two of Burbank's successes in this direction were mentioned.

(2) Flower-aggregations were quickly discovered in examples of sweet alyssum, verbena, shepherd's purse and candy-tuft. Specimens of the inflorescence were taken to the class-room for comparison with each other and with the cornflower (*Centaurea*).

(3) The door-yard knot-weed or "goose-grass" was found and observed not only on the almost bare path but also on the grassy path and among grass quite off the pathway. Where are the plants most vigorous? The longest stems were on the last named situation but the most vigorous plants along the grassy paths and in patches considerably trodden. Why there? The theory offered that in wet weather the seed is distributed by the traveller's feet accounted for the presence of the plants but not for their comparative vigor in the different situations. The pressure of the heel on their stems and on the leaves of dandelions and the leaves and stems of some other plants afforded means of comparing injuries by treading. The stems of the knot-weed were injured only on the path or ground where it was bare and hard and even there the small leaves escaped. But why are the plants less vigorous when they are scarcely or not at all trodden? Comparison with the dandelion on the spot was invited whose rosette of radical leaves smothers out competitors. It was at last concluded that where there was just enough treading to keep down the grass and other softer plants the door-weed would receive more light and air and consequently be more vigorous. The appropriateness of

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the names "door-weed" and "knot-weed" were discovered but why it is called "goose-grass" was reserved for future observation to discover.

The feature of the investigation that impressed me most forcibly was Professor Dearness' solicitude that the students should DO something to make a basis for every known answer or to justify it. It seemed as though he would prefer errors of interpretation of observation or experiment to truths that were merely guessed or stumbled upon.

Nature-Study in the Gary Schools

MARGARET AHEARNE

(Paper presented at the Philadelphia meeting)

In discussing nature-study in the Gary schools, I shall have to speak more or less about the whole system.

We have two large schools which have high school departments, the Emerson school and the Froebel school. All of the other schools contain the grades only. Even in the high schools the children are spoken of as ninth grade and tenth grade children rather than as freshmen and sophomores.

Owing to the differences in the grades in the different buildings, each building has developed nature-study in a slightly different way. The class of children taught, the environment of the children and the training and individuality of the teacher also play an important part in the way in which the nature-study is developed.

At the Froebel building the enrollment is nearly two thousand. The majority of these children are in the lower grades. For instance in the first grade there are ten divisions averaging thirty-five each. Froebel is unusual in that there are so many children in the primary department. There are at least twenty-eight different nationalities represented at the Froebel school.

All of the primary children in this building have nature-study during the year. There are two nature-study teachers for the primary department. The children have a one hour period a day. When a new teacher tries to devote a whole hour to nature-study she is apt to run out of material very quickly or else give the children more than they can assimilate. But gradually she finds ways by which she can use the whole hour with profit.

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At the Froebel school a great number of the children are just beginning to speak English. The difficulties of teaching nature-study which demands such a varied vocabulary are illustrated by the following story: One morning toward the close of the period, being somewhat distressed by the behavior of one of my classes, I asked them among other things if they wouldn't turn over a new leaf the next day. I was very much gratified to see all the hands go up. Then at least five children sang out, "Where will we get the new leaf, in the woods?"

Adjoining the school building there are over twenty acres of land partly woods, partly swamp and partly sand. We would sometimes take four or five trips a day to the woods when the birds were migrating. Then we could get so much good material there. I often went to the woods with my class in application and brought back enough material to last several days, such as oak galls of many different kinds, goldenrod-galls, leaf-miners' tunnels with and without a tenant, willow galls, caterpillars, butterflies, spiders, flowers, frogs, turtles, salamanders and lizards.

Connected with each nature-study room is a good-sized conservatory. Here the children learn how to care for plants, make cuttings, plant bulbs, in fact do all the things necessary for the health of plants. We always have a number of bulbs. The children plant these and learn all about them. Later on they draw them in bloom and often buy them.

In the spring-time we started a large garden 35 x 140 feet for the primary department. It was large enough to allow the second grade children to have individual gardens. The children of the first grade had community gardens. We began to work in the garden about May first and until the close of school, June nineteenth, the children worked in the garden whenever the weather permitted. The garden products were sold. Fifty-six dollars was cleared on this garden.

The children from the third to the eighth grades get their nature-study work by observing the older classes. That is the sixth grade or the eighth grade will be divided, part of them going to one class and part of them going to another class. The children of the third and fourth grades will join the children in the upper grades. They are eager to help the other children with whom they are working in any way they can. This system is carried out through all the departments. Each class in botany, zoology,

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physics, chemistry, domestic science, and manual training has its observers. The work of all these departments is sometimes slightly modified to come within the scope of the younger observers.

The nature teachers take a great number of field trips; all-day trips on Saturday and shorter trips during the week.

Mr. Wirt, our superintendent, encourages the keeping of live animals. At the Emerson building the boys of the manual training department built a pigeon house large enough to accommodate nineteen pairs of pigeons. Then four boys and the principal of the building clubbed together and bought the pigeons. They raise many squabs and sell them and divide the profits. While the boys that own the pigeons are responsible for them, all of the other children learn about them, both from the nature-study side and the commercial side. A similar scheme for raising chickens will be started at the Jefferson school this spring.

They also have about ten rabbits, two coyotes, two foxes, several squirrels, raccoons, prairie dogs and crows. All of these animals have large roomy outdoor cages built by the manual training boys. In the class room proper they have several pairs of ring-neck doves, guinea pigs, parrots, mice and other small animals and birds. They also have a large aquarium for fish and several tanks providing homes for turtles, frogs and clams.

All the classes that come to this room whether for physiology or zoology learn about all these animals and birds. Connected with the intermediate and upper grades also is a large garden. The botany teacher has charge of this garden as well as the conservatories in different parts of the building. The children do the greater amount of work in watering the flowers, repotting and transplanting. The garden is begun toward the end of April. The children plan their gardens in the school room and under the supervision of the teacher or older pupils lay out and plant them. In one garden this year the children were allowed to keep the produce of one-half of the garden and the teacher sold the produce of the other half. The garden department in the Gary schools must be self-supporting in about the same degree as the manual training and domestic science departments are.

The gardens are begun during the regular term. We have a three weeks vacation between the closing of school and the opening of summer school. The gardens are out-of-door laboratories. The children look after them all summer under the direction of

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the regular school garden teacher. Most of the produce is sold to the parents of the children. Not only the children who work in the garden but all the children are buyers. Just because vegetables are raised at school they want to buy them. In the fall the material from the gardens forms the basis of the nature work and botany work.

The garden money is used to buy bulbs, seeds and plants for the next year. Among the plants bought this year were four currant bushes and six grape vines. These were placed in the Jefferson school garden which is a small garden. We already have a good sized asparagus bed. Our idea is to teach the children how to plant and care for, not only the commoner kind of vegetables but also those which will save their parents the most money if grown at home.

The daily auditorium hour has a definite place in the Gary school system. The auditorium hour furnishes an opportunity for producing a kind of work which cannot be done as effectively in the class room. The majority of the children are very anxious to take part in the auditorium work. After one has given a series of lessons on a subject, one can give the same lesson to a limited group on the stage. The lesson given in the auditorium will be a review but at the same time it will be so dressed up and embellished that it will not bore them like an ordinary review. When children can talk before an audience of two or three hundred they are surely well grounded in their work.

The auditorium work is usually an outgrowth of the class work. During the year I have given work for this period on moths, butterflies, rabbits, pigeons, chickens, galls, stars, snow, seed dispersal and illustrated talks on flies and birds.

With the older children we have experiments showing why we have day and night, the rotation of the earth about the moon and the sun about the earth, and on the capillarity of the soil. We also have days devoted to the study of nature poets and nature poetry. It is an incentive to children to learn poetry when they know they will be allowed to recite it later in the auditorium.

During our application periods we have an opportunity to develop along different lines. The botany teachers in the schools which have high school departments and nature teachers in the other buildings have charge of the school grounds. We can then

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divide our class and set a few at work planting shrubbery and others working on different parts of the grounds. Then too one can use the application hour to write out lessons or stories which they have had in their regular nature-study period.

One strong proof that the children are interested in nature-study is the number of things which they bring to the nature-study rooms. Frogs, turtles, a woodpecker, a chipmunk, a kitten, two mourning doves, a Virginia Rail, two young pigeons, an owl, fish of all kinds and an alligator are among the live things which they have brought to me this year. The room is too small to hold the amount of inanimate things which they bring. On the whole one really enjoys teaching nature-study in Gary.

The School Fair an Aid to Gardening

L. A. DEWOLFE

School gardens are not new in Nova Scotia. Owing to increased financial aid, however, the present year has seen an immense increase in their popularity. Possibly I should modify this by changing "school gardens" to "school children's gardens."

The home garden is apparently what meets our needs. We are not ready for the school garden yet. The latter, however, must come as a result of the interest aroused in the former.

Yet, the garden, in itself, is not extremely popular. It is only an incident. The real attraction is the School Fair, where the products of the garden are exhibited. A description of the working of the fairs here may not be uninteresting. Doubtless, however, they are much alike the country over.

Previous to 1914 not more than half a dozen schools had held fairs. This year, however, the number has grown to forty. Next year, we hope for one hundred.

Possibly the greatest value of the fair is the fact that it brings the parents to the school, allows them to meet the teachers, and enlists their heatry co-operation in the natural side of their children's education.

What do we exhibit? Everything we can get the children to make, or to collect, or to grow. An average fair would consist of the following:

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Upper. Part of a Nature Exhibit. Truro, Nova Scotia.
Lower. Teachers-in-training gardening a vacant lot. Truro, Novia Scotia.

(1) Collections of pressed plants, classified into weeds, leaves, garden flowers, mosses, ferns, etc.

(2) Collections of weed-seeds, garden seeds, native woods, native insects, minerals, etc.

(3) Collections showing the industrial activities of the town or village.

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(4) Collections of sewing, cooking, canning, wood-work, cardboard work, brush work, nature drawings, essays, etc.

(5) Collections of vegetables grown by the children at home or on the school grounds.

(6) Collections of cut flowers and potted plants.

(7) Collections of poultry.

The foregoing list is sufficiently large to show the scope of work undertaken.

At these school fairs, small prizes are offered. We believe in many small prizes rather than fewer large ones. There are then fewer disappointed or discouraged children. Competition is sufficiently keen to call for the best efforts of those competing.

It is certainly encouraging to see the interest the parents take in their children's successes—or even in their attempts. Where fairs are held for the first time, parents are frequently unwillingly coaxed by the children to attend, but when they see the exhibit, and learn that it is all the work of children, they are as enthusiastic as the children themselves. This is fortunate, for the children have the home encouragement the second year that too often was denied them during the initial year of the experiment.

To be sure, the teacher must take the leading part in organization and supervision. At our Summer School, held each year in Truro, about one hundred teachers specially qualify for this sort of work. When they go to a strange school, and begin to use nature work in association with the lifeless subjects of the curriculum, they are sometimes looked upon as faddists. The fair, however, wins the public over to their side.

Ninety per cent of our Rural Science teachers (for that is the name we use for those taking the special nature course) are young women. They are extremely enthusiastic and, in general, are good leaders. There are many things they do not know; but nearly all are ready and willing to do their best.

A Rural Science diploma is granted to teachers who do satisfactory work for three summer vacation periods at our training school in Truro. In connection with this training school we had, last summer, three model school gardens, and three vacant lot gardens. Towards the end of the session, we held a school fair. Thus the teachers had experience in the activities they were expected to carry out in their own schools. We also conducted a Garden Club. In some schools this becomes a Potato Club, a Tomato Club, etc.

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As a result of these efforts, children are taking a much greater interest in their school surroundings. They now ask the teacher if they may plant flowers, set out trees, or plant a hedge. Not long ago, the teacher had to do the asking; and received very little response when she did ask. Children also take shrubs and flowers home; and take an interest in beautifying their home grounds.

About 800 children exhibited products of their handiwork this year. Over 600 children had home gardens. These numbers will be more than doubled next year.

The school fair has come to stay. The children demand it; the teacher wants it; and the parents are fully converted to it.

Plants for Class-Rooms

ELLEN EDDY SHAW

So often we are asked this question, "What can I raise successfully in my class-room?" It is not an easy question to answer, for it all depends. It depends upon amount of sunshine in a room, heat and fall of temperature nights and week ends. For most class-room plants have week-end parties, frightfully chilly affairs. In spite of drawbacks, we catch the "plant" fever each spring. I believe, personally, that something may be done in any class-room. This something may not be the thing one most desires.

Perhaps the only place for a window-box is at a window by which is a radiator and the box must go directly over the radiator. In such a case, why not have a little house for seedlings which are to go to the home or school gardens later in the season. Fill the box with sand which should be kept moist all the time. In the box plunge up to their rims, flower pots or place shallow boxes, called flats, on the surface of the sand. If glass is tilted upon one end along the side of the box toward the window, you have a miniature greenhouse. Buy begonia bulbs, pot one each in three inch pots for this sand box. Do this in February and by June, you will have sturdy begonia plants. After the begonias are well started, say when they have three or four leaves, take the pots out of the sand bed and place them anywhere in the room. They will be fine little plants when school is over and they are extremely interesting as they develop.

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The most staisfactory of all plants for children to raise from seed and obtain a blossoming result in a short time, is the dwarf French marigold. It will bloom in from five to six weeks after planting. These seeds may be planted in thumb pots for the children of kindergarten age, or with the older children use three inch pots or low boxes (flats). Sweet alyssum may be treated in the same way. It takes from six to eight weeks to flower. Plant four to six seeds

Transplanting Seedlings. Christmas Sweet Peas on Side Bench

of either kind in the small pots, and eight in the larger ones. When these come up, and never do all of them germinate, reduce the number of plants in each pot leaving three in the small pots and four to six in the large pots. The little dwarf French marigolds do not grow very bushy, so the pot can hold more than one would suppose. If flats are used, sprinkle the seed over the surface of the soil, scatter a little soil over them, let this layer be no deeper than one quarter inch. Then water such pans or flats of seedlings through cheese cloth. Any ordinarily good soil will do for this work. If it is possible to have a bench or table in some out-of-the-way place, then use this for a potting bench. Buy a cheap sieve of about quarter inch mesh of wire, and then the children can have a fine time sifting the soil. For this work with small seeds is helped materially if the soil be fine, too. After the soil is sifted mix in with it some rotted manure or some leaf mold. If either of these is available, give the class a regular soil receipt for potting of seedlings. Three parts garden soil to one part leaf mold or rotted

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manure makes a good mixture It the garden soil is clayey, add one part of ordinary sand. When these soils are apportioned, mix them thoroughly together with the hands. It is as good fun as the mixing of a cake.

Another interesting seed to try is what is termed the "Christmas Sweet Pea." There is an excellent variety of this called "Earliest of All." These pea seeds may be planted four to a three inch pot. Plant them one-half inch deep. Use the same soil mixture. These

Making Blue Prints of Seedlings Around Potting Bench

pots may be plunged into the sand box. They must have a light, warm, sunny spot. As they grow sticks (bits of bush) must be put into the pots for the pea plants to twine upon. These grow almost eighteen inches high. They will require nearly ten weeks to start their blossoming and will bloom from that time on until school closes. Pick the blooms as soon as they open up and more blossoms appear

Oxalis bulbs and gladioli (Bride) may be started indoors in February. The variety of gladiolus mentioned here is a good, forcing indoor variety.

Ask someone to donate canna roots from his own stock stored away for planting out in the spring. Plant these canna roots in five inch pots; leave the tips just out of the soil. Set the pots in some cool place for almost two weeks. Then bring into the

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warmth. The boys and girls will have nice big canna plants to set out in their gardens when it is time to do so. And at the same time these young cannas are decorative in the class-room.

Botanical nature-study which can be given along with these plants started for a purpose seems rather better than using entirely material like beans, peas and corn which must be thrown out after a series of lessons. Planting such seeds as the cobæa vine seed offers such an opportunity for real nature work. The cobæa seed shows the germ so plainly. The vital part like the eye of the bean should be placed in direct contact with the soil. This leaves the cobæa seed standing up on end, looking like the sail of a ship. Great care must be exercised in placing the quarter to half inch layer of soil over these seed. Plant three seeds in a three inch pot. As the first leaves appear, then the second pair, see what opens up, what differences. You have here two types of leaf, simple and compound. Later tendrils come. There is a lot of botany crowded into the cobæa seed. These cobæa vines grow twenty to thirty feet high. They may be planted out in early June.

A class may raise seedling material enough to stock everyone's garden in that class. In March start in boxes or pots in the class-room, calendula, stock, phlox, pansy and lobelia, also tomatoes, egg plant, lettuce, melon, and parsley. One class of children at the Brooklyn Botanic Garden had great fun with lobelia (Blue King). They raised enough to border the children's gardens and for each child to take home all he wished. It is a border plant, growing about four inches high and beautifully blue of color.

All these seeds should be started in fine soil. When the plants are yet very small, after the first leaves appear and second just show, transplant to other boxes, pots or pans. Place each little plant about one inch from its neighbor. Possibly a second transplanting will be necessary.

These are only a few suggestions from my own work with children at the Ethical Culture School, New York City, and the Brooklyn Botanic Garden. More and more it seems to me that lessons in nature-study which work toward real and necessary ends are to be used rather than those which have fancied or forced reasons for being.

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Apple Day in Quincy High School

O. D. Frank

In order to add interest to the Botany work we plan to do some things that are "different" each year. Since Quincy is located in a fruit producing section we have for a number of years observed "Apple Day." The day, as Miss Bert has indicated in her article, originated in Quincy. We are proud of good old Quincy, with her seventeen beautiful parks, elm-canopied streets, the Father of Water, "the orchards, the meadows, and the deep tangled wild woods" of the surrounding country,—enough to make one poetic.

We have several orchard kings, as we call them, who have taken a kindly interest in our Botany classes; each year they assist us in observing Apple Day by inviting us to their orchards, by furnishing us with many varieties of apples, and by giving talks on the subject of apples. Last fall we visited Mr. Charles Williamson's orchard, and this spring Mr. Gustav Klarner invited us to visit his orchard at apple blossom time. This year Mr. Leaton Irwin invited us to be his guests on Apple Day. After studying the apple as it grows in the orchard each student brought one dozen or more apples to the laboratory and a display was arranged; the Superintendent of Schools, the parents and members of the faculty were invited to inspect the display. Appropriate placards were placed on the walls of the laboratory extolling the virtues of the apple. A special table was prepared for the visitors; apples, apple pie, apple cake and apple cider were served and apple topics which had been prepared by the students were given.

The following are some of the subjects that were discussed: "Origin of Apple Day." "The Economic Value of the Apple." "Enemies of the Apple Orchard." "Spraying of the Trees." "Ways of Preparing Apples." "Insect Pests." "The Unnecessary Waste in the Orchard." "The Apple Blossom as a National Flower, etc."

After completing our apple exhibit the apples were sent to Dr. Caldwell, the author of our Botany text, who exhibited them at the University of Chicago, later sending them to the John M. Smyth School where the pupils studied them and wrote composi-

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tions about apples (the compositions were sent to our Botany class). The apples were then sent to the domestic science of the school where jelly was made from them. The jelly was sent to a hospital as an added joy to some little children's Thanksgiving dinner.

How We Celebrate "Apple Day."

[The following from *The High School "Q"* of Quincy, Ill., is by a member of the Botany class.—EDITOR.]

The apple has been called the King of all domestic fruits, and rightly so, for no other fruit is as universally liked as it; the people who do not care for apples are decidedly in the minority. So popular has it become in the last few years that the second Tuesday in October has been set aside as "Apple Day," and on this day the whole nation pays tribute to the apple and its virtues.

Captain James Handley, of Quincy, was the founder of this day, so it was most fitting that the Botany classes of the Quincy High School should do homage to this day. Knowing that we would remember our apple lessons longer if we could go to the scene of the growing and packing, and could actually see all of the processes of apple culture and marketing, Mr. Frank made arrangements to take us out to Mr. Leaton Irving's apple farm so that we might personally inspect it. Apple Day was chosen for the trip. As it happened, our choice could not have been better, for the day was ideal and we were all in the best of spirits. We started at eight and made the trip in automobiles loaned for the occasion.

As to the farm itself, space does not permit my telling all of its good qualities. Suffice it to say that in 1912 Mr. Irwin took the second place at the State Fair for the best managed orchard, and only lost the first place to one of the State University's orchards. Such an honor any man could well be proud to have earned.

After our arrival we were shown all over the place; we saw the men picking the fruit, saw it taken to the packing house where it was sorted, packed, and loaded on the wagons for market. It was in the packing house that I learned one of the secrets of Mr. Irwin's success in life. It is his honesty. Into each barrel are put apples of one size or grade and this grade is marked on top.

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The quality of his apples is the same on the top, bottom or middle of the barrel, and the merchant who buys No. 1's from Mr. Irwin is sure that *all* will be No. 1's. With many unscrupulous packers the middle layer is of an inferior quality, and some have even gone so far as to place a tube of "culls" through the center and to have larger apples packed around this. This is to satisfy the doubting merchant who may take off a stave to test the quality of the middle layer. But no merchant need doubt Mr. Irwin's word, for they all know that the grade printed on the barrel will not belie the contents, and for this reason he can demand prices that the others cannot.

To me, the care of the orchard in the early spring is most interesting. The trees are sprayed seven times a year; once before the leaves come, once after they are off, and five times during their growth. But the first spraying is the most important because this is done while the trees are in blossom. Large tanks of the poisonous spraying fluids, each containing 120 gallons are used for this purpose. Each tank is operated by three men; one who stands on top where he can reach the tops of the trees, and the other two walk one on each side where they can spray the lower branches as the tank is drawn between the rows of the trees. Great care must be taken to spray every apple, for only in this way can wormy apples be prevented. Mr. Irwin uses from two to five gallons of the fluid to each tree, and I might add that a worm in one of his apples is a rare sight indeed.

After our most thorough tour of the whole place, and after we had eaten the lunch which we had brought along with us, we returned home every one of us a wiser boy or girl as far as the apple question is concerned, and we were all greatly benefited by having had such a splendid chance to meet and study a man with so great a personality as Mr. Leaton Irwin.

ELIZABETH BERT.

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Gardening at Bloomington, Ill.

Courtesy of *School and Home Education*

J. K. STABLETON

For several years we have been growing about three thousand Grand Pacific tomato plants for distribution among school children, giving to each a single plant or at most but two. The children were to set the plants in their home gardens, cultivate them and care for them in every way, and in September bring the finest of the fruit of the vines for tomato exhibits at the different ward schools. Prizes were awarded for the finest tomatoes.

This worked finely for several years, but last spring we thought we might do well to attempt something on a larger scale. So after a talk with our teacher of Agriculture and Nature-Study, we decided to have the pupils try to raise fifteen thousand Grand Pacific tomato plants for the purpose of giving ten plants to each of fifteen hundred pupils in the grammar grades for home cultivation. Full instructions were to be given on the cultivation and care of tomatoes in the home garden.

Fifteen thousand tomato plants are a good many, but the teachers and pupils entered into the work enthusiastically, so I felt sure the plants would be grown.

First the boys, under the teacher's direction, put all available space that could be given to tomato beds in our two small greenhouses into condition to receive the seed. But this was not sufficient space for so many plants. So they proceeded to make three hotbeds, one each at three of the buildings that have no greenhouses. In this way they prepared plenty of forcing room.

They planted the seed, and later on transplanted the plants to boxes, cans, and to beds out of doors covered with cheese-cloth to strengthen the plants and give them room to make a good growth before they should be taken home for the final planting. To do this took time, but the pupils worked in squads and enjoyed it, and were learning lessons that I think are of great value.

Finally, when the time came to distribute the plants among the fifteen hundred grammar grade boys and girls, I found we had more than fifteen thousand plants ready for distribution.

Before giving out the plants, we gave each pupil a slip of paper on which was printed instructions on "How to Grow Grand Pacific

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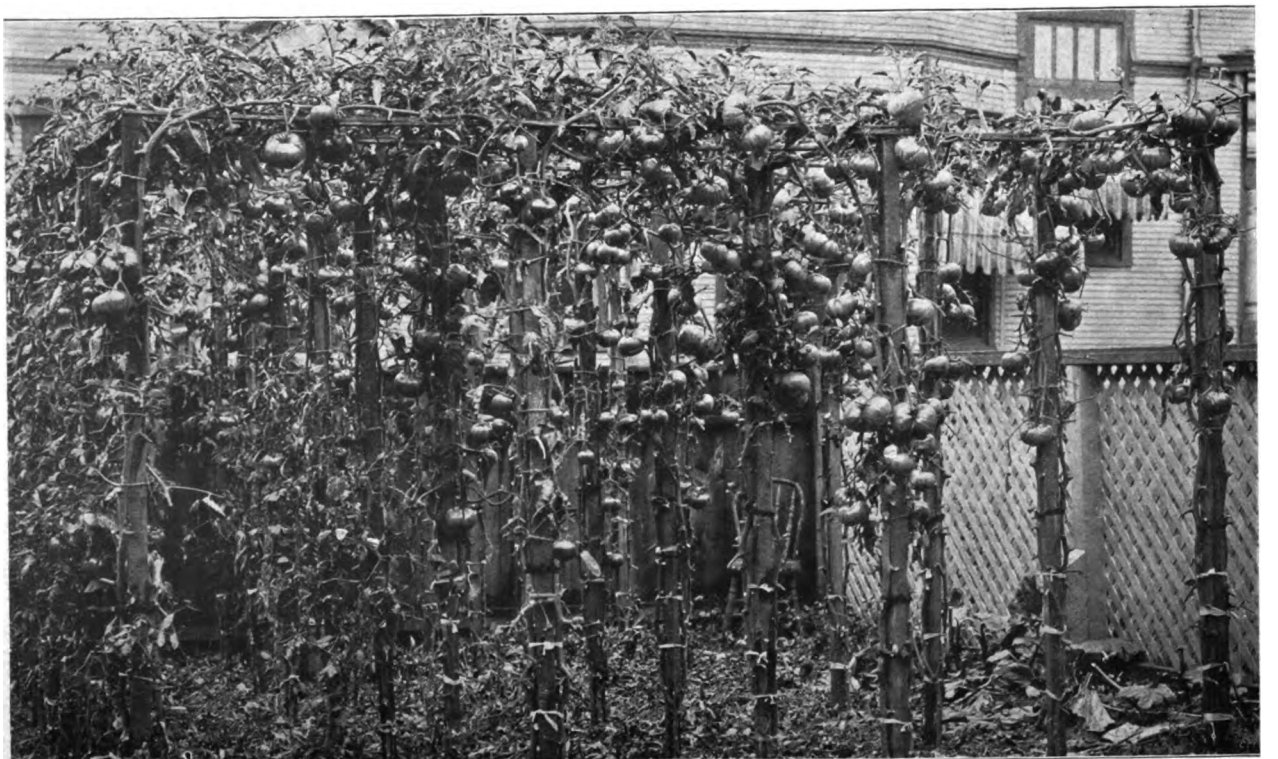

Gardening at Bloomington, Ill.

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Tomatoes;" and a printed letter with a return letter asking the parents to join with us in the tomato growing scheme, and to indicate their interest by signing the return letter and sending it to us.

The parents entered heartily into the work, thus making us feel that Bloomington would be a great garden of Grand Pacifics.

The following are copies of the instructions "How to Grow Grand Pacific Tomatoes" and of the letter to parents.

How to Grow Grand Pacific Tomatoes

Select a spot of ground with full exposure to the sun. When the soil will crumble nicely, spade the ground the full depth of the spading fork.

After the ground has been carefully prepared set the posts or stakes for the trellis making it from six to eight feet high.

If the plants are to be set along a fence or building they can be fastened to the fence or building in place of a trellis by using strips of cloth around the vines and tacking the cloth to the wall or fence.

Set the plants one foot apart in a row along the trellis, fence, or wall. As they grow, trim them to single stems or not more than two stems. Continue the trimming throughout the whole season. Close trimming turns the sap of the plants to the fruit clusters and produces fine clusters of fine large tomatoes.

Keep the ground well cultivated. After every shower stir the surface soil with a rake so as to keep the surface covered with finely broken up soil.

Should the summer be dry, once a week thoroughly saturate the ground about the tomatoes with soap-suds or water and a day later rake it. The cut at the head of this letter shows the possibilities with this variety of tomatoes.

J. K. Stableton.

Bloomington, Ill., April, 1914.

Bloomington Public Schools,

Dear Patron:

With the hope of arousing a deeper interest in gardening we have planned a contest in growing tomatoes the coming summer. In order that the work may be of greater value we would like the co-operation of parents.

The plan is to give each scholar of the city schools in the grammar grades ten Grand Pacific tomato plants for his home garden. With each ten plants we will give printed instructions on how to grow them.

Then in order that we may know whose plants produce the greatest quantity of tomatoes we wish each scholar to have all tomatoes gathered from his vines weighed at one of the nearby groceries or at any grocery that is willing to keep lists of scholars growing tomatoes and to weigh and record the weights for them. Prizes will be given. A first prize, $5 for the greatest weight of tomatoes from any one ten plants and a second prize of $2 for second greatest weight from any ten plants.

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Slips of paper for keeping the records will be furnished each grocery that will keep records.

If you will co-operate with us to the extent of arranging a place for your son or daughter to grow tomatoes and in helping to follow out the instruction "How to Grow Grand Pacific Tomatoes" **please sign and return the lower part of this paper.**

Very respectfully yours,

J. K. STABLETON.

BLOOMINGTON, ILL., April, 1914.

I will join with the schools in the tomato garden work by giving my son or daughter a place for a garden and in trying to see that he or she follows out the directions during the summer.

Signed,

After the dry, hot summer set in, I feared the opening of school in September would find but small records of tomatoes grown, notwithstanding our promising beginning; but the rains came late in the season and many plants that had not fruited at all during the hot summer produced fine fruit, while in gardens where the plants were watered freely all the summer through, the yeild was surprisingly large for so hot a summer. The extreme heat blasted many buds, even where the plants had plenty of water.

The greatest weight vouched for as grown from any ten plants is 123 lbs. 6 ozs. Had it been a good season this amount could have been doubled. While many picked from their vines only 20 lbs., 30 lbs., 40 lbs., 50 lbs., or 70 lbs., there is a general feeling the results more than justify the undertaking, and that with a good season a remarkable showing would be made.

To me the most valuable fact of it all is the deeply interested contact these boys and girls have had with growing plants from seed to fruitage.

This fall we have planned to have a supply of blooming bulbs for each school building all the latter part of the winter season. Each fall the boys plant large beds of bulbs for early spring flowers. Tulips are most extensively used, but hyacinths, narcissi, and other bulbs form a part of the fall planting. This year we have made a change. The boys have planted the tulips in the yards as usual, and they have also prepared bulbs in pots for winter blooming. Mr. Kern, our teacher of Agriculture, has had full charge of this work, and has carefully directed the boys in all they have done.

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He has not only taught the boys and directed them in preparing the bulbs for winter blooming, but he has given instruction and demonstrations on how to prepare the bulbs to the girls as well as the boys in a large number of our grammar grade rooms, and has distributed the printed instructions to all of them.

For winter blooming bulbs we secured one hundred Dutch Hyacinths so that every room in the grades below the High School might have a fine stalk of bloom. The Dutch hyacinths bloom late in the winter. Roman hyacinths come into bloom much earlier than the Dutch even when planted at the same time and given the same treatment. A single stalk of a Dutch hyacinth makes a great show when in bloom; while a single stalk of a Roman hyacinth makes but little show.

For each building the boys have planted ten Roman hyacinths in one pot. This will give a pot of flowers before the Dutch hyacinths come into bloom, and the fact that ten of them are in one pot makes it a very beautiful pot of flowers. If we could have afforded it, we would have planted a pot of these for each room, but we could not, so the one pot of Roman hyacinths must be passed from room to room, until all the rooms in a building have had it for a time. The Roman potted early in October should be in bloom soon after Christmas, and almost before they are gone the Dutch will begin to show color. Other bulbs potted for each school garden are narcissi, fresias and syllia.

The following copy of our printed instructions tells how forcing is done.

Growing Hyacinths Indoors

Some time in October hyacinth bulbs should be planted if they are to bloom during the winter months. The following directions are given for the planting and care of the bulbs:

First—Secure a large, strong, well ripened hyacinth bulb at any good florist. It will cost about ten cents. Be sure to get the right color.

Second—Secure a flower pot or tin can about 4 or 5 inches in diameter, with hole in bottom for drainage. Place a piece of broken flower pot, wire gauze, coal, or cinder over hole inside of pot or can, to keep earth from escaping.

Third—Place about an inch of rich garden soil in bottom of flower pot.

Fourth—Place bulb on soil with top up. Pointed end of bulb should be up.

Fifth—Fill pot with soil, pack firmly, and water well.

Sixth—Dig a trench in garden and place pot in, top up, and cover with earth to a depth of 6 or 8 inches. Pack earth over pot.

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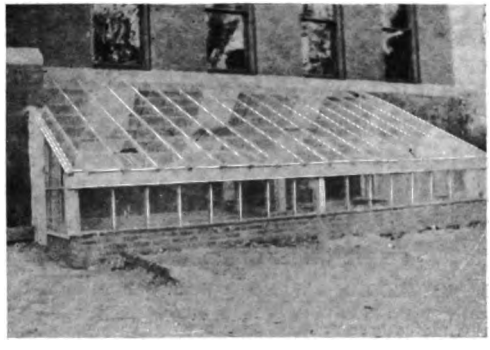
Seventh—Six or eight weeks after planting roots will be fully developed. Pot may then be brought into a warm room and kept until it blooms. It takes 4 to 6 weeks for plants to bloom.



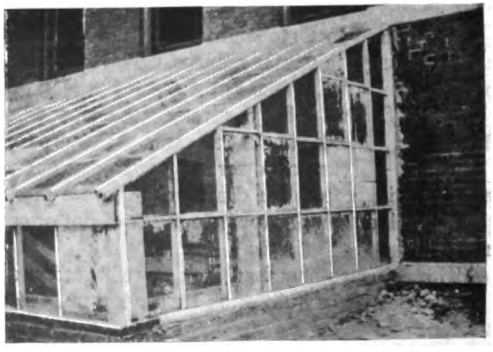
Eighth—Leave pot in soil out of doors until 4 to 6 weeks before bloom is desired. Then bring into warm room.

E. S. KERN.

Just as soon as ours have been buried eight weeks, the boys will remove them to a dark, cool, basement room where they will remain for a week or possibly two weeks. Then they will be brought gradually to the light and warmth. The final forcing can be done in any living room window or in the school windows. We will bring ours to full bloom in the greenhouses and then transfer them to the schoolrooms.

Having had the two small greenhouses for a number of years, we should hardly know what to do in our plant work were we deprived of them. When I write of our winter blooming bulbs, I do not wish any one to infer that we are neglecting other plants. We are trying to vary the work each year and at the same time hold on to all that we have found good in the past.

I'm sure our people and our board appreciate fully what our little greenhouses have meant to us for this year. The board has given us the means to rebuild the greenhouses at Lincoln School and to improve it greatly. Even now it is not an expensive building as exclusive of the heating apparatus it costs less than one hundred dollars. The accompanying cuts give a fair view of this greenhouse. It is built against the south side of the building,



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thus using the school house wall for the main wall of the greenhouse. This is a great saving in construction.

This greenhouse is 20 ft. long, 13 ft. wide, and 9 1-3 ft. high on the school house wall. It is heated by hot water from a hot water plant within the school building.

Editorial

School Gardening in America

The most notable recognition of the School Garden Movement during the last year has been the establishment of a department of School Gardens by the United States Bureau of Education. This department proposes to employ two or three people to assist in promoting the movement everywhere in the United States. It is not only an official recognition but a commanding endorsement.

The growth of school gardens in America has shown during the last three years a much more steady advance than ever before. The effort on the part of ephemeral workers to take advantage of this movement for personal exploitation is not so marked as in former years. There are a number of real and carefully planned systems of school gardening now in operation. The Boards of Education of the following cities are committed to school gardening and are supporting them to a marked degree.

Philadelphia, Los Angeles, Portland, Ore., Sacramento, St. Paul, Cleveland, Kansas City, Mo., Providence, R. I., Dayton, O., and Cincinnati, are cities which have already established school gardening some to a very great extent.

School garden directors have been employed throughout the season in most of these cities.

School gardens have also been developed to a considerable extent in Detroit, Grand Rapids, Saginaw, Mich., Superior, Wis., Lincoln, Nebr., Dubuque, Ia., Salt Lake City, Richmond, Va., Memphis, Tenn., Louisville, Ky., Athens, Ga., Birmingham, Ala., Pittsburgh, Pa., New Haven, Conn., Rochester, N. Y., Boston and a number of other cities in Massachusetts, New York, Yonkers, Poughkeepsie and Albany in New York State. In fact, the time has arrived when nearly every city in the United States and in Canada have done something in children's gardens. It has either

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been attempted by some school betterment association or an individual.

The children's home garden always follows the school garden. In fact, it is the natural result. It seems to me a little unfortunate that a certain differentiation, or almost antagonism has been developed between these two phases of the same movement. A child's garden at home under the auspices of his school is certainly a school garden. A school garden is any garden conducted anywhere by the school. It may be at the school, in a vacant lot, in a park, along the sidewalk or at the homes of the pupils.

It seems to me not a little discouraging that certain people have endeavored to capitalize the home garden for reasons that appear to be personal. The garden at the school should always go hand in hand with the garden at the home of the child. The garden at the school is a model of teaching and sets an ideal of work. The garden at the home of the child is the living result which is bound to follow the garden at school.

The greatest difficulty in carrying on school garden work is to bridge over the vacation period. The year-round school is the best way to accomplish this, but since that is a "far-cry," school garden directors and teachers must be employed. While the schools are in session the regular teachers should be trained in the work of directing the children just as far as possible, but during the summer extra teachers must be employed. The funds to support school gardening will be available the moment the people are lead to feel that it is just as necessary for the child to be educated in the open for, at least, a part of the day, as it is for him to be educated within the four walls of a classroom. The outdoor education, with its wealth of agricultural and scientific material is a fundamental in the education of children and worth paying for.

VAN EVRIE KILPATRICK,
President of School Garden Association of America.

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Chicago Nature-Study Club

The officers of the *Chicago Nature-Study Club* for 1914–1915 are as follows:

President, Dr. H. S. Pepoon, Lake View High School; Director: Grant Smith, Chicago Normal; Secretary-treasurer, Mary Powers, Haines Practice School.

North Side Section—Chairman, Frederick W. Plapp, Carl Schurz High School; Secretary-treasurer, Mary V. Donoghue Stewart School.

West Side Section—Chairman, H. B. Shinn, Carl Schurz High; Secretary-treasurer, Elizabeth Dimmer, Andersen School.

South Side Section—Chairman, Rebecca Freeman, Taylor School; Secretary-treasurer, Sue J. Reid, Revere School.

"Union Trips" were made during the fall to Glenn Ellyn, September 26, Leader, Dr. Moffat; Beach, Oct. 12, Mr. Plapp, Mr. Shinn; Tremont, October 24, Mr. Warrallo Whitney.

There was a good attendance for each trip. Tremont was best of all, in spite of rainy weather.

The Chicago Nature-Study Club has a series of meetings planned for winter months—first meeting was held November 14 at City Club. The meeting was an informal affair preceded by luncheon served in room where meeting was held. Five minute (or less) talks were given by Mr. Whitney, Miss Freeman, Miss Reid, Mr. Hornbaker, and others.

The second winter meeting will be held next Saturday at City Club, 2 P. M., preceded by one o'clock luncheon for all who so desire, 75 cents a plate.

Many rather liked the idea of luncheon in connection with monthly winter meetings as they seemed to think good feeling and congeniality are thereby promoted among the members of our organization.

Dr. Pepoon presided November 14, and he is certainly a good presiding officer and toastmaster, if one might presume to use the term in connection with such an informal affair.

Mr, Whitney (Bowen High) will give his lecture on Forestry at December 12 meeting.

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There is a wholesome enthusiasm among the members of the Chicago Nature-Study Club. Many new members have joined since September, 1914. The "Union trips" was a happy plan as the various sections have been brought together so often now that there is a feeling of unity—and unity is strength.

Hastily,

MARY V. DONOGHUE.

Michigan Nature-Study and School Garden Association

Friday, October 30, 1914, KALAMAZOO, MICH.

The meeting of the Michigan Nature-Study and School Garden Association was called to order by Dr. Harvey, who, in introducing Mrs. Anna Comstock of Cornell University, called attention to the fact that Nature-Study, Home, School and Landscape Gardening, and Roadside Planting occupied a prominent place on the Michigan State Teachers' Association program.

Mrs. Comstock gave a very fine presentation of the results of Nature-Study work in its two-fold effect on education; its influence on the child in developing his observational powers, his imagination, his love of truth, his logical sense; and its influence on the teacher by keeping her in sympathy with child life, by making her a student with the child of the wonderful world about her, by keeping her "young" in spirit and in enthusiasm.

Mrs. Comstock discussed very fully the advisability of using whatever material is available for Nature-Study work—of using anything that the children bring in, be it bird, beast, plant or insect; of using this material as long as interest is shown in it by the children and of then returning it to its natural environment. She also discussed the use of aquaria, terraria and moss gardens.

Mrs. Comstock spoke of the value of notebook work, but added a caution as to criticisms of notebook work, saying that it was the spirit of the observation and the truth of the record that were to be looked for and not the grammar or the English.

The close correlation between Geography and Nature-Study was also discussed.

Following Mrs. Comstock's address Mrs. Elliott O. Grosvenor of Detroit told of the development of the School Garden work in Detroit. In 1903 the 20th Century Club appointed a com-

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mittee to further the work of School Gardens in Detroit. The work was started along lines similar to the work carried on by the Cleveland School and Home Garden Clubs. In 1913 the work of this committee was recognized by the Board of Education and since they have worked together. There are a number of Garden Clubs that are self-governing, that elect their own officers, look after the gardens and help in many ways to make the school gardens a success. Stereopticon slides showing many phases of school garden and home garden activities were shown.

Mr. James Starkweather of Kalamazoo told of the garden work being carried on by the schools in Kalamazoo. His talk was also illustrated by slides showing classes and individual children at work in school and home gardens.

Miss Gowan of the United States Bureau of Education spoke of the work carried on under Mr. Claxton's supervision in collecting data along the lines under discussion and suggested that any teacher wanting help or information write to Mr. Claxton's Department for assistance.

At the business meeting following, Miss Francis Van Buren of Grand Rapids was elected chairman for the 1915 meeting and Miss Kate Passolt of Saginaw, secretary.

LOU I. SIGLER, *Secretary.*

News Notes

The program of the Nature-Study Club of Indiana has been received. It is a neat booklet outlining numerous trips and meetings. Their headquarters is a log cabin in the woods. The Club issues a paper now, *Buzzes from the Roost* (their cabin is the Roost).

Miss Schively's article in the December number was by courtesy of *The Teacher.*

Through the kindness of Mr. G. W. Lee we are in receipt of an attractive program from the Field and Forest Club of Boston, of which Dr. C. J. Douglas is president. It is an organization with interests closely allied to ours.

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It is said that the German invaders of Belgium, whatever else they may have destroyed, have been careful not to injure park trees. The cavalrymen, so a report goes, are forbidden to tie their horses to trees for fear that the animals will gnaw the bark. Germany was the first nation to apply forestry on a large scale, some of the crown forests having been under scientific management for over a hundred years.

The March number of *The Guide to Nature*, Arcadia, Sound Beach, Conn., will contain several pages of the most elaborate, beautiful and interesting photographic illustrations of buds. These are large photographs.

Mr. M. O. Evans, superintendent of School and Home Garden Work, Portland, Oregon, has been appointed Assistant State Leader of County Field work for the State of Oregon.

A movement to provide a memorial in honor of the late I. N. Mitchell, former head of the science department in the Milwaukee State Normal School, and who, in conjunction with Mrs. Mitchell, for a number of years prepared the Wisconsin bird studies for the Arbor Day Annual, was started by the alumni of the normal school, at a meeting held in connection with the convention of the State Teachers' Association this month. The memorial will probably be in the form of an annual scholarship or prize.

Book Reviews

FARM LIFE READERS, Books 4 and 5. Evans, Duncan & Duncan. Silver, Burdett & Co. Book 4, 344 pp., 45c. Book 5, 372 pp., 60c.

As the editor indicates, these books attempt to put into the hands of the grade pupils readers dealing with subject matter that has to do with the environment of the farm. We seem to have an educational spasm which nothing will soothe but economically valuable material. As one looks over the table of contents there is a good scattering of authors' names that are familiar to the student of literature, but one suspects that in the attempt to get

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material that deals with the animals and plants and processes of the farm and country, literary standards have been sacrificed. If the books are used merely as supplementary readers in addition to, but not in place of, the standard literary readers, they undoubtedly will serve a very excellent purpose, but it would seem a shame to have articles on plant diseases, testing seed corn, the care of milk, plant improvement, and the home vegetable garden, take the place of David Copperfield, Hans Brinker, John Ridd and other heroes dear to the boy's heart.

THE ADVENTURES OF JERRY MUSKRAT. Thornton W. Burgess. 120 pp. Little, Brown & Co. 50c.

This is an interesting little story of Jerry and his companions of the ponds and streams. To the adult mind, especially if it has a scientific bent, the conversation of muskrats, turtles, and frogs who are dressed in evening clothes and silk hats, seems decidedly incongruous, but the boys and girls of six to eleven for whom this book is intended undoubtedly enjoy the element of personality in the tales of animals.

The author seems to have the happy faculty of keeping his story in a natural setting and teaching not a little of the habits of the animals along with the story that he is telling. The boy and girl who is interested in the out-of-doors will enjoy the book and it will likely stimulate their observation as well as prove an interesting bit of reading.

A MANUAL OF WEEDS. Ada E. Georgia. Pp. xi + 593. The Macmillan Co. $2.00.

This is one of the rural manuals edited by L. H. Bailey, which is a guarantee of the quality of the book. In the fall of the year, when school begins, especially in the city, the bulk of the available plants for plant-study are weeds. Vacant lots and neglected corners afford to the nature-study teacher abundant material, but it has been difficult heretofore to identify much of this material unless the teacher was a botanist and could identify with the Gray's Manual. In the present book the pictures are given of all of the common weeds, so that even one who knows little botany may identify with fair ease. There is then given a description of each weed with information regarding its time of blooming, its range, and the means of control, besides interesting points regarding its

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original habitat. It is a book that is primarily intended for the farmer, that he may know more thoroughly the plants with which he has to contend, but it makes a very excellent book to add to the nature-study library.

SEXUAL ETHICS: A Study of Borderland Questions. By Robert Michels. Pp. xv + 296. The Walter Scott Publishing Company, London; Charles Scribner's Sons, New York. $1.50.

This volume is a new one in the Contemporary Science Series. It is a comparative study of sex relations and sex questions in the various countries throughout the world. After a preliminary chapter, the author discusses sexual education and states his belief that we should plainly answer plain questions rather than attempt to give detailed instruction. The remainder of the book deals with borderland problems and deals with them in a very thorough way. Part One takes up the problems of the erotic life; Part Two deals with such problems as apply to the extra-conjugal conditions; Part Three with the pre-conjugal conditions, and Part Four with the conjugal life itself.

It is a book designed primarily for special students and the author's views are sustained by abundant facts which he has at his disposal.

FARM ANIMALS. Hunt & Burgett. ix + 534. Orange, Judd & Company. $1.50.

In the first lesson the authors undertake to give some notion of the classification of animals, or as they call it, the "assortment" of animals, and this in ten pages. Lesson two on Animals Made Useful, discusses Darwin's theory regarding natural selection, the process of artificial selection, heredity, atavism, and Mendel's Laws—all in ten pages. Lesson three tells of the relation of animals to man. The bulk of the book, however, is taken up with discussions of the different breeds of animals, feeding of animals their care, and animal products. At the end of many of the chapters there are practical exercises. Lessons (chapter) 5–9 are on Feeds, Rations and Digestion; 10–15 are devoted to the Horse; 16–21 to the Ox and Cow; 22–24 to Sheep. The Pig has three chapters. Goats, bees and fish for the farm are each treated in one chapter. Fowls of the Farm take up seven chapters. Milk is discussed in four chapters. The diseases of farm animals and their health occupy six chapters.

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As a reference book for the school library in a school devoting considerable time to agriculture, this would make a good addition to the library, and in the hands of a well versed teacher it might serve as a text in animal husbandry It seems, however, to the writer that it is rather a book of information than a pupil's text book; the pupil who uses it might get a good deal of information but little education. That criticism, however, is one that is almost inevitable at the present until the relatively new material that is serving as subject matter for a text of this sort shall be worked over enough to determine how to make it of large value educationally. The subject matter is well classified, clearly presented and gives a wealth of detail; still the underlying principles are usually made prominent.

HEALTH WORK IN THE SCHOOLS. Hoag & Terman. xiv + 318. Houghton, Mifflin Co. $1.60.

This is one of the Riverside text books in education put out by Houghton, Mifflin Co. We have reviewed in previous numbers of the magazine two other books in this series, and this one deserves the same sort of thorough commendation. The opening chapter on The Social Responsibility for the Health of School Children is a statement of the school's realization of its duty to look after the physical welfare of the child as well as its mental life. The next two chapters deal with the scope of the work and the organization and will be largely suggestive to the school superintendent. Chapter four deals with the work of the school nurse. Chapter five is an exceedingly valuable chapter for the teacher and deals with the problem of grading the children in health.

The next two chapters are on the school clinic. Several chapters follow on transmissible diseases, then there is one on the open air schools. Chapter 13, on school housekeeping, the janitor should read. The rest of the book deals with the problem of teaching hygiene, including sex hygiene and the hygiene of the teacher. Chapter 18, the last chapter, is a survey of what the world is doing for the health of school children. In the appendix there is a list of books for the teachers' library. This is quite an indispensable book to anyone who is trying to keep up with the health work that is being done in the schools. It is one that can profitably be read by the layman as well as the teacher and it will certainly be read by parents—at least those who are trying to

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co-operate with the schools in parent-teacher associations and such organized parental efforts to improve the school situation.

THROUGH THE GRAND CANYON, FROM WYOMING TO MEXICO. E. L. Kolb. Pp. xix + 344. The Macmillan Co. $2.00.

Mr. Kolb and his brother Emory are professional photographers and have lived for years in the Grand Canyon taking pictures of its varied aspects. The present book is the tale of the consumation of an ambition which they had for years, namely, to go through the Grand Canyon and similar canyons above it taking pictures, especially using a moving picture machine. In all they travelled some 1600 miles by river descending in this distance something over 6000 feet, so that in many spots the river was perilously rough. Many preceding parties had been ship wrecked and the adventurers drowned, though several had succeeded in making the trip. Mr. Kolb and his brothers are naturalists as well as photographers, and the tale gives many details of the interesting animal and plant life encountered en route. It is as a tale of thrilling adventure, however, that the book appeals most. Anyone with a particle of red blood will be stirred by the descriptions of the descent of some of the more difficult stretches of water.

Mr. Kolb himself at the outset had little or no experience with a boat, so that he learned to row in the first few miles of quiet water. He evidently soon grows used to the operation, for the later experiences taxed the skill of sturdy boatmen. Usually the boat was turned with the bow up stream, the oarsman rowing to prevent the boat from going too rapidly. In this way the boatman was able to see the difficult places down stream. Not uncommonly the rapids were too swift and rocky to be undertaken in this way, and then with lines attached to the boats the latter were guided from shore or by members of the party wading in the shallow waters. Some of the precipitous descents were too difficult to be run in this wise and as a last resort the boats and supplies were carried around the obstructions. Portageing was the last resort, however, since not infrequently it involved dragging supplies up and down almost impassable shoulders of the canyon walls.

The book is one that any person who enjoys adventure at all will read with delight. The reader has also a very vivid notion of the Grand Canyon and of the work the river is doing far below the level of the surrounding plains. It is one of those wonders that

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can scarcely be realized—nothing like it exists elsewhere in the world in so stupendous a scale.

HOOF AND CLAW. Charles G. D. Roberts. 291 pages. The Macmillan Co. $1.35.

Nature lovers anticipate with delight the appearance of a new book by Charles G. D. Roberts for he tells his animal yarns with much skill. He keeps well within the bounds of possibility also and does not make his animals extraordinary geniuses—he writes of the common herd. There are fourteen stories in the present volume, several of these are humorous. "The Bear that Thought He was a Dog" and "Up a Tree" each have a jolly laugh in them, while the last story, "Brannigan's Mary" runs close to the pathos of animal existence. The stories are all of them up to Roberts' usual excellence and for the nature lover at least it will leave a much pleasanter taste than the bulk of current romances.

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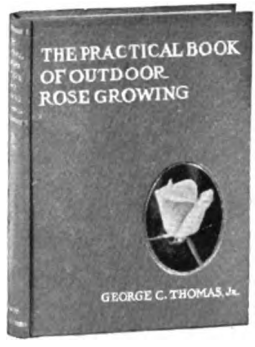

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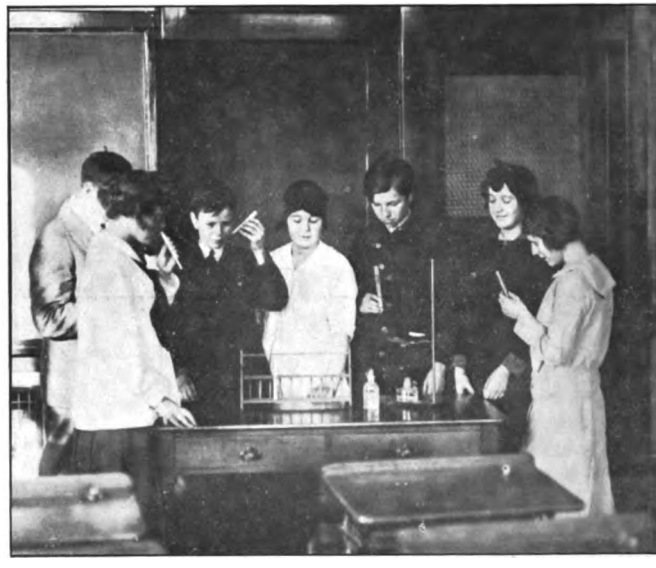

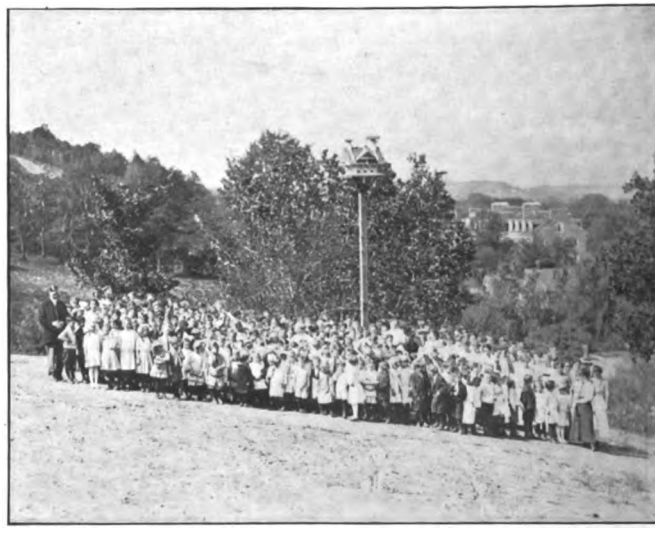

Upper: Chemistry of Cooking. Grammar Grades.
Lower: Dedication of Martin House in schoolyard.

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THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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VOL. 11 MARCH, 1915 NO. 3

Preface

It was the unanimous opinion of those present at the December meeting of the American Nature-Study Society at Philadelphia that no other matter is now more important in the nature-study movement than the formulation of proper plans of organization for nature-study materials for school use and the lucid statement of the principles of methods to be used in presenting such materials.

The normal schools and teachers' colleges are almost universally offering courses designed to prepare for grade instruction in some such nature work (134 out of 141 so far reporting). The editor recently sent out letters of inquiry to the State Superintendents of Public Instruction in all the states and to similar officers in the territories. The replies indicate that nature-study or equivalent elementary science is almost without exception, recommended by them, is outlined in a large majority of the state courses of study and is required by law in not a few states. In the survey of a single typical state it was recently found that 70% of the towns and cities replying to the questionaire have in operation a definite course in nature-study All of which facts seem to indicate educators are agreed that the grade pupil shall have some systematic contact with the physical and biological elements in his environment to the end that he may acquire varied sensory stimulation, conscious ideals of exact scientific thinking, may achieve a reasonable comprehension of commonplace industrial mechanisms and processes and may be subjected to the moral and æsthetic influences of nature. The work must now be organized and taught so as to justify the time given to it and to prepare the way for its largest usefulness. The following fairly full statement of the course in vogue at the Mankato (Minn.), Normal School is offered as a study in the organization of materials and the embodiment of principles. The editor desires to express his appreciation of the labor that Mr. Trafton and Miss Reynolds have put upon this number of the REVIEW.

THE EDITOR.

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Outline of Nature-Study

For use in the Elementary School of the State Normal School, Mankato, Minn.

PREPARED BY

GILBERT H. TRAFTON

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OUTLINE OF NATURE-STUDY

Aims of Nature-Study

The aims of any subject should be as broad as life itself, in as far as that subject touches the various phases of life. Nature-study is so closely related to many vital aspects of human life, that the aims of nature-study must be broad and comprehensive.

In the preparation of these outlines the two great functions of education have been kept in mind, to promote the welfare of the individual and that of society. As applied to nature-study this two-fold aspect may conveniently be divided into four aims; the esthetic, the social, the economic, and the hygienic; the first dealing largely with individual welfare, the second with social welfare, and the remaining two with both individual and social well being.

Esthetic Aim—One important aim of nature-study is to furnish greater pleasure in living. Enjoyment is an element necessary for the most successful living. Everyone demands and seeks some form of enjoyment. Some of the pleasures thus obtained are positively harmful, some are worthless, and others are helpful. One purpose of nature-study is to furnish a helpful kind of enjoyment that shall make life more worth living. The study of nature furnishes many opportunities to derive such pleasure. Thru all his life one is surrounded with a wonderful variety of beautiful plant and animal forms. People are realizing today as never before the advantages of living outdoors in contact with nature. The enjoyment of life is greatly increased, oftentimes, perhaps, unconsciously, if one knows the trees that help so much to make the landscapes beautiful, and can name the flowers that adorn the roadsides and gardens, and sees and hears the birds that gladden the springtime by their beautiful colors and musical songs.

The raising of flowers, vegetables, and fruits in the home garden is a source of much pleasure, as well as having economic and hygienic bearings.

Young children derive great pleasure in keeping pets, and the care of these pets has the further advantage that it helps to develop in children a sense of responsibility.

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The pleasures that nature furnishes are of almost universal application, in that nearly everyone may derive some pleasure therefrom, if attention is called in school to these possibilities and children are taught to know the common forms of life that everywhere surround them. No special training is needed to enjoy these pleasures, and they are free to all.

The relative stress to be laid upon the various aims must evidently depend upon the age of the child. The esthetic aim should be the dominant one for young children, and relatively less important for the older children, but should, however, be kept in mind thruout all the grades.

Economic Aim—Somewhat in contrast with the esthetic aim stands the economic aim, dealing with practical affairs. In the great variety of wild life are found both beneficial and injurious forms, the former of which should be protected, and the latter destroyed or controlled.

Among the birds we find that the great majority are beneficial, altho a few are injurious. Among insects are found some of man's worst enemies. In the vegetable garden, in the fruit garden, among the field crops, and in the household are troublesome and serious pests, which must be controlled. Some are even dangerous to human life. On the other hand there are many insects of great value to mankind. Weeds are another great pest not only to the farmer and gardener, but to the town dweller as well.

Every citizen needs to know something of the economic aspects of these numerous forms of life, in order that he may guide his actions more efficiently.

Gardening has an economic aspect worthy of careful consideration. The constant upward trend in the cost of living presents a serious problem for the great majority of people. A garden, even tho small, may be one factor in helping to reduce the cost of living, and at the same time may furnish the most healthful kinds of food.

There are many phases of so called physical nature-study, such as the telegraph, the telephone, the steam engine, the motor, which play so vital a part in modern life that some knowledge of their significance is essential to an intelligent existence amid present day surroundings.

The economic aim may be kept in mind to some extent in the intermediate grades, and may share with the social aim the dominant place in the grammar grades.

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Social Aim—During recent years the social aim of education has been strongly emphasized, and properly so. Man above all other forms of creation is a social being. As modern improvements and increase in population bring people closer together both potentially and actually, and make them more dependent upon each other, the duties that one owes to his fellows become of increasing importance. Coöperation, not competition, is the watchword of our advance today in all phases of activity, political, religious, and industrial, as well as educational.

Nature-study has many opportunities to teach children how they may best perform their social duties and coöperate with others to promote the best welfare of all.

Some forms of wild life, such as birds and forests, are of great value to the entire country and should be protected and preserved. During the years past the true value of birds and forests has not been appreciated and these natural resources have been squandered even to the point of extinction of some species, of which the passenger pigeon is a recent example. We may teach our boys and girls that preservation of birds and forests is one of the duties of citizenship, and that for this coöperation is necessary.

Thousands of people are killed every year thru the agency of the fly and mosquito in carrying diseases, and yet practically all these deaths are needless, because by proper coöperation the citizens of any town can control these pests. The work in nature-study may well be the means thru which such an interest may be aroused in both children and parents, that efforts may be made which will lead to a flyless and mosquitoless town.

The social aim may find its beginnings in the intermediate grades as soon as the age of the children enables them to appreciate some of its phases, and should be the dominant aim in the grammar grades.

Hygienic Aim—The need of a healthful body as the basis for all activities of life is self-evident, as is also the need of teaching boys and girls how to keep their bodies healthy. But unfortunately, the practical working out of the teaching of physiology in the schools seems to have been unsuccessful. There is a tendency now to include physiology and hygiene as a part of nature-study. This is an excellent plan, and the teaching of hygiene has been incorporated in these outlines. There are many opportunities to teach hygiene in connection with nature-study topics. The writer

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believes that when taught in this way more effective results will follow than when taught as a separate subject.

In connection with gardening may be taken up the question of exercise, and the study of vegetable foods. In connection with the methods of heating the home there naturally arises the question of ventilation. The study of the fly and mosquito brings up the study of bacteria in relation to disease. And with other subjects which do not so directly connect with nature-study topics, it is believed that better results will follow if they are arranged as an organic part of the nature-study course.

The hygienic aim should be kept in mind thruout all the grades, beginning with the youngest children and increasing in importance as the advanced age of the children enables them better to understand the need and laws of hygienic living.

Abandoned Disciplinary Theory—In the years past the disciplinary aim of education has been dominant, in accordance with which the chief aim of education was to discipline the various powers of the mind, such as the powers of observation, reasoning, memory, and imagination; in the belief that after these had been trained in school, the powers thus acquired could be turned to use in any walk in life. In connection with nature-study it was common to emphasize the value of training the power of observation. The researches of modern psychology compel the abandonment of this theory of general discipline and a substitution of the theory of specific discipline, in accordance with which training which is received in school becomes useful elsewhere only when applied to the same or similar conditions. Thus in nature-study the child should be taught to observe and reason about those things in school which it is desirable for him to observe and reason about in actual life.

The use of the power of observation is a method by which nature-study is taught, but the training of this power should not be the aim. It is a means and not an end.

Another serious objection to the disciplinary aim is the fact that it is non-selective in its functioning. An aim should serve as a guide post to the teacher pointing out the things to be taught. The disciplinary aim does not serve this function, for the study of any one form of life will serve its purpose of developing the power of observation as well as the study of any other related form.

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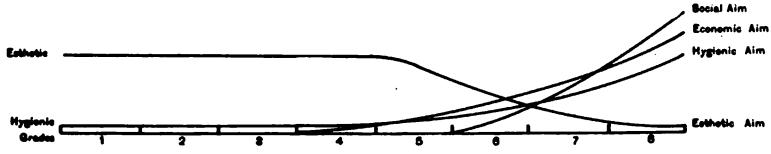
The following diagram will suggest the relative importance of the various aims of nature-study in the different grades. The distance of any curve above the base line represents the relative stress laid on that aim.



Relative emphasis on aims of Nature-study in different grades.

Materials Available for Nature-Study

One of the features that characterizes nature-study and makes it worth while is the fact that it deals largely with the concrete living things in the child's environment. In order that the child may derive the most benefit from his study, it is necessary that he should have actual concrete material to observe in his lessons. So that the procuring of some kind of material for nature-study lessons is something for which the teacher should make definite plans. Frequently the assistance of the children may be sought in securing this material, and this forms a valuable lesson for the children.

The great mass of materials available may be classified into the following groups: 1, living things in their natural environment; 2, living things in the school room; 3, preserved material; 4, pictures; 5, apparatus for demonstration and experiments. In general the first four are arranged in the order of their value, but there are some exceptions to this. Number five deals with a different kind of material so that it is difficult to indicate its relative value.

Living Material in Natural Environment—The best kind of material is the living object in its natural environment, because this is as it is actually seen in the life of the child. This study of material outdoors may be carried on in two ways; by means of field trips in which the teacher accompanies a group of children, and by means of individual studies by the children under the charge of the teacher in the school room. Both these methods are desirable. The conditions in our schools are usually such that it is not practicable to take many field trips. But plans can often be made to take at least one trip a term, and by means of this the

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children may be given suggestions as to how they may make observations when by themselves. If a class is too large to be taken altogether, frequently arrangements can be made to take half of the class at a time, and leave the other half in charge of the principal.

The second method of studying life in its natural environment, by encouraging and expecting the children to make studies by themselves, is one of the most valuable lines of work that can be done. One of the applications that it is desired the child shall make thru life is observation of the life around him, and the more closely we can approximate in school the application desired in life, the more probability is there that this application will be made. In connection with each lesson the teacher may suggest some questions that the child may answer from outdoor observations on the topic of the lesson, and these answers should be called for by the teacher at the next lesson. At first there will be many children who will not make these observations, but the number who do make them can be greatly increased by expecting the children to do this the same as any home work and by giving frequent opportunities for the children to report on their observations. This work will be greatly stimulated by keeping spring calendars of birds and flowers in which a record is kept of the name of the bird or flower seen, the date when first seen, and the name of the child first reporting it. This record may be kept either on the board or on a large piece of cardboard. Similar calendars may be kept of the leafing and flowering of trees in the spring and of the coloring and fall of leaves in autumn.

Living Material in the Schoolroom—In many ways the most practical kind of material is the living material kept in the school room. Here we have missing the environment, but we still have life. There is a great abundance of material available here. Various kinds of pets, including canaries may be kept in the schoolroom for a short time. A great many insects such as crickets, grasshoppers, caterpillars, and many others may be kept in glass jars covered with mosquito netting; mosquito wigglers may be kept in tumblers; fishes, tadpoles, snails, toad's eggs, and many kinds of water insects may be kept in glass jars filled with water. Nearly all kinds of plant life may be kept in the school room, such as flowers, leaves of trees, ferns, and mushrooms. Experiments may be performed with seeds and seedlings, and house plants such

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as ferns, geraniums, and bulbs can be kept permanently in the room.

Preserved Specimens—In the group of preserved specimens life and environment are both missing and only the form is left, but for some topics this kind of material serves the purpose well. Children can be set to work making collections, and thus while looking for material they will find objects in their natural environment. Some of these materials may be collected and kept in the schoolroom without any preparation to preserve them; such as bird's nests, galls, cocoons, wasp's nests, tree-fruits, specimens of woods, woody mushrooms, weed seeds, ears of corn, plants of wheat and other cereal crops. Some materials may be preserved by pressing them between the leaves of books with weights placed upon them; such as flowers, ferns, weeds, leaves of trees, shrubs, and vines. Insects may be kept in glass mounts made of old negatives. This collecting may be done in the fall so that the material may be available for winter use.

Pictures—In the picture not only are life and environment gone but the thing itself as well, and we are dealing with only a representation of the real thing; but for some objects pictures form very desirable material, as in the case of birds. Good bird pictures may be obtained of The National Audubon Society, 1974 Broadway, New York City. On application circulars will be sent giving lists and prices.

Apparatus for Demonstration and Experiments—For much of the work in physical nature-study and for some work in hygiene and with plants, simple apparatus will be needed for demonstrations and experiments.

Methods of Teaching Nature-Study

The teacher finds two problems constantly confronting her; what to teach and how to teach. The following outline is an attempt to answer the first problem of what to teach in nature-study, and a few suggestions will here be given relating to the problem of how to teach nature-study.

As previously mentioned the teacher needs to consider the matter of materials, and it is also suggested that a consideration of the three following points for each lesson or topic taught may prove helpful: 1, the child's problem; 2d, the development of the lesson

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based on the problem, and 3d, the application or use by the child of what he has been taught.

Child's Problem—The child's problem is a means of arousing the child's interest. It should be a question that appeals to him, that he is anxious to solve. This should find its origin in the present need and environment of the child, that is, it should be a child's and not an adult's problem. It should be very definite and specific and so stated as to involve only one leading question. It should be something the solution of which is evidently well worth while. This problem will serve not only as a stimulus to the child but as a guide to both child and teacher to determine what particular phases of the topic shall be taken up. Hence it is evident that the first step is get the problem clearly before the children so that they may understand distinctly the purpose of the lesson. In order to interest the children in the problem, it may be lead up to by questioning the children regarding things they already know about some topic closely related to the problem. The problem should be the central thought of the lesson around which the points to be taught may be grouped.

In the outline, questions are suggested which may serve as problems for the topic under consideration.

Development—The development should be based upon the problem. The purpose of this is to solve the problem and only those points should be included which are necessary for this solution. All other poiuts which have no bearing on the problem should be omitted. Enough points should be included in the development to answer the problem satisfactory. The problem will be the basis not only for the selection of the subject matter but for its organization as well.

Application—The use of knowledge is the chief end of education. One of the vital things in planning a nature-study lesson is to consider how the children may be encouraged to make use of what they have learned. If the problem does not seem to allow of any application, we may well inquire whether the problem is really worth while.

Following are suggested some ways in which application may be made: 1, actually doing things suggested in the lesson, as in planting a home garden, destroying insect pests and weeds, building nesting boxes for the birds, planting trees, helping parents at home;

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2, making outdoor observations on the topics studied such as flowers, trees, birds, and insects in their natural environment; 3, bringing specimens to school to show the children's ability to identify the form studied; 4, watching others doing the things studied, as the farmer and gardener plowing their fields or harvesting their crops; 5, making collections such as weed seeds, woods, flowers, leaves of trees, ferns, and insects; 6, talking over with the parents at home the topic studied; 7, cutting out clippings from newspapers and magazines relating to the topic under consideration.

A few suggestions regarding the working out of the various parts of a lesson are given below in brief outline form.

Preparation—

Introduction to Child's Problem.

1. The introduction to the child's problem should deal with the children's experiences.
2. It should be appropriate to the problem.

Statement of Child's Problem.

1. The child's problem should relate to those things for which the child already has a feeling of interest or need, or for which he can be lead to have such a feeling.
2. It should find its basis in the child's present life, or in that of his immediate future.
3. It should be worth while.
4. It should be definite.
5. It should deal with only one main thought.
6. It should be clearly stated in children's language.

Development—

1. All points included in the development should relate to the problem.
2. Enough points should be included to answer the problem.
3. The development should be well organized with reference to the problem.
4. Provision should be made for summarizing the essential points.

Application—

1. The application should be the doing of something which interests the child, and which can be done naturally in his ordinary life.
2. It should be something which the child can probably be lead to do.
3. It should suggest the doing of only a few things, preferably of only one thing.
4. It should be stated clearly and with sufficient detail so that the child understands what he is to do.

As a definite illustration of these suggestions the following lesson is given for a third grade:

Topic—Elm and maple tree.

Materials—A maple and elm leaf for each child; a cluster of elm and maple leaves showing arrangement.

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Presenting Child's Problem—How many of you children have trees in your yard at home? How many different kinds have you? Have you noticed how many kinds of trees there are in our school yard? Would you like to know the names of these trees so that you can call them by their names as you do your friends? Two trees growing in our yard are the elm and maple. I have here some leaves from these trees and we will study them to see how they differ so that we can tell the elm from the maple tree by means of their leaves.

Development—

OUTLINE OF POINTS	QUESTIONS
Shape of leaf—	What differences do you find in these leaves? How are they different in shape? Several may go to the board and make a drawing of each leaf and we will ask the class to decide which shows the shape best.
Size—	Is there any difference in the size?
Margin—	Are the edges alike? Make a drawing on the board of the edges of the two leaves.
Veining—	Do the veins run in the same way in both leaves? Can some one make a drawing to show the difference?
Arrangement—	Look at these clusters I have here and see if the leaves are placed the same on both trees. Which do you think is the easiest way to tell these leaves apart?

Application—When school is dismissed you may look carefully at the leaves of the trees in the school yard and find a maple tree and an elm tree. Tomorrow I will ask each of you to tell the class exactly where these two trees are. When the leaves begin to change color, we will watch these two trees and see if their leaves turn the same color.

In the development the outline suggests the main points to be brought out that will help solve the child's problem. The exact questions to be asked can not be definitely planned beforehand. It is better to ask a few leading questions than many minor ones. The question involved in the statement of the problem "What differences do you find in these leaves?" would be sufficient to bring out most of the points in the lesson. After the children have exhausted their answers to this question, if some other points of difference have been overlooked, the teacher may then ask another question to direct the children's attention to this point. The questions given in this lesson are intended for this purpose in case some point is overlooked. It is not expected that it will be necessary to actually ask all these questions.

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Relation of Nature-Study to other Subjects

The nearer our schoolroom procedure can approach life conditions, the more effective will our teaching be, as the greater are the probabilities that the child will make use of that which he learns in school. Correlation is the natural and common procedure in ordinary life. The unit is not the subject matter involved, but the activity in which the person is engaged, and our ordinary activities involve a great variety of subjects. Hence, natural correlation is a desirable thing to be made an organic part of teaching. Convenience seems to demand that the various subjects should be taught separately, and hence there is all the more need that there should be found some interest that shall unite and correlate these various subjects.

Furthermore, psychology teaches that when a topic is approached from several standpoints and taught in its relation to other things, it becomes more surely a part of the child's experiences than if taught disconnectedly.

Nature-Study and Art—There are many opportunities for natural correlation in nature-study. This is specially true in connection with art and literature. Many nature-study topics permit of correlation with art. Much of the material used in the nature-study lessons may be reproduced by the child by means of free hand cuttings and drawings with colored crayons for younger children and outline drawings and paintings in water colors for older children. For young children a large amount of handwork is necessary thruout all departments of school work, and the drawings and cuttings may furnish this in connection with the nature-study lessons.

Nature-Study and Literature—In literature are many references to nature, and he who would most truly appreciate literature needs know something of the plants and animals to which reference is made. Our poets write often of birds, flowers and trees, and whenever these farms are studied in the nature-study lesson, the study of some appropriate poem will add greatly to the child's appreciation of the object studied. It is also true from the standpoint of literature that the child's appreciation of the poem is increased if some study is made of the forms to which reference is made.

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Nature-Study and Geography—In home geography, the correlation between nature-study and geography is so close that frequently the two are taught together for the first two or three grades under name of nature-study. The relation between these subjects is also close in the later grades. Geography is constantly dealing with nature-study topics, thus presenting a natural opportunity for correlation.

Methods of Correlation—Correlation may be brought about in several ways. For instance if it is desired to correlate nature-study and art, the following possibilities arise: 1, during the art period a brief study from the nature-study standpoint may be made of the material being drawn; 2, during the nature-study period drawings may be made of the materials being studied; and 3, the same topic may be studied in both the nature-study and art periods, in one from the nature-study standpoint, in the other from the art standpoint. The method to be used will depend upon the conditions existing in the school. The last arrangement seems from some standpoints the ideal one, but under present conditions it is difficult to bring it about. If both subjects to be correlated are taught the methods suggested under 1 and 2 offer the best opportunity. If only one of the subjects is taught in the school, the only possibility is to correlate with the other subject during the regular period of the first subject. The writer suggests that the teacher may occasionally utilize a part of the nature-study period for art work and for the study of literature appropriate to the nature-study topic.

The chart on the following page may suggest some of the possibilities of correlation with a few leading nature-study topics, showing what may be done in the nature-study period.

Basis of Organization

The basis for the organization of this outline has been sought in the child's life rather than in the subject matter; and in the interests and needs of the child's present life and immediate future, rather than in the interests and needs of the distant and indefinite future. In thus stressing the present, the future is not overlooked, for the fulfillment of the child's present needs is the best possible preparation for the fulfillment of his future needs when these may arise.

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Correlation Chart of Nature-Study and Other School Subjects.

Nature-Study Topic	Literature	Art	Geography	Arithmetic	Manual Training	Language	Civics
Birds	Read literature about the birds studied.	Color outlines of birds. Make artistic bird calendar.	Migration. Change in bird life according to seasons.	Problems on the number of insects eaten by young birds.	Make nesting houses, feederies and fountains.	Reports on outdoor observations.	Bird club to protect birds.
Trees.	Read literature about the trees studied.	Color autumn leaves. Draw leaves, trees, winter twigs, fruits, sections of wood. Freehand cuttings, Charts.	Forestry. Seasonal changes in trees.	Problems on height of trees and on board measure.	Make collection of woods.	Reports, both oral and written on outdoor observations.	Conservation of forests.
Flowers.	Read literature about the flowers studied.	Colored drawings of flowers and fruits. Draw leaves.	Flowers grouped according to season			Reports on outdoor observations.	Protection of wild flowers.
Gardening.	In connection with garden activities, read poems about gardening.	Cuttings and drawings of garden tools. Drawings of seedlings, leaves, flowers, fruits. Make plan of garden.	Dependence of garden activities on seasons.	Problems on measurement of garden and garden planting.	Make window boxes, stakes, and labels for garden.	Reports on garden activities as topic for composition work.	Use of vacant lots. Summer gardens under charge of city.
Insects.	Read poems about insects studied.	Draw insects, cocoons, galls, wasps, nests.		Problems on the amount of harm done.	Make breeding cages.	Topics for written work.	Control of fly and mosquito by town authorities.
Weeds.		Draw plants and fruits.		Problems on the number of seeds borne by a single plant.	Make cases for holding weed seeds.	Reports, both oral and written, on outdoor observations.	Weeds in vacant lots; Weed laws.

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The purpose has been to make the outline psychologically and pedagogically logical from the child's standpoint, rather than technically and systematically logical from the scientist's standpoint.

The general principal governing in the selection of topics for this outline may be briefly stated as follows: any topic is worthy of a place in direct proportion to the number and value of the elements which it possesses in common with the child's life.

The selection and arrangement of topics in the outline may be considered from four standpoints: 1, the general aims of nature-study; 2, the phases of nature-study included; 3, the seasons of the year; 4, the age of the child.

The arrangement of topics from the standpoint of aims has already been discussed and is shown diagramically in figure on page 99.

Phases of Nature-Study—Five large phases of nature-study have been included: the physical, the astronomical, the hygienic, the agricultural and the biological, using this last word in a limited sense to mean the study of the common wild plants and animals.

The physical phase is taken up in the intermediate and grammar grade with more emphasis in the higher grades.

The astronomical phase is taken up in the intermediate grades, brief studies being made of the sun, moon, stars, and planets.

The hygienic phase receives consideration thruout all the grades. In the first six grades special attention is given to personal hygiene, in the seventh grade to the hygiene of the home, and in the eighth grade to public health. For this work it is suggested that two textbooks be used, one in the sixth grade and another in the eighth. For the sixth grade such books as Hutchinson's, "The Child's Day," or "Gulick's, Good Health" are suggested; and for the eighth grade such books as "Coleman's, The Peoples Health," or Gulick's, "Town and City."

The agricultural phase is included in the intermediate and grammar grades. In the intermediate grades home gardening is emphasized with special reference to raising the common flowers and vegetables. In the seventh grade special attention is also given to home gardening, emphasis being laid on the general planting of the yard including shrubs and vines; and both fruit and vegetable gardening are considered. In this connection a brief study is made of soils.

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In the grammar grades a study is made of weeds, insects, and birds in their relation to agriculture.

The distribution of these phases by grades is shown in the following diagram:

Distribution of phases of Nature-study thruout grades

The Seasons—The natural activities of the season have been followed, the various plants and animals being studied when they are most in evidence. This puts the agricultural and biological phases in the fall and spring, leaving the physical, astronomical, and hygienic phases to be taken up during the winter. In the fall special attention is given to fall flowers, trees, and insects; and in the spring to spring flowers, birds, and gardening.

In the study of trees, the same species is studied thru one grade in the fall, winter, and spring, thus showing the different aspect of tree activities.

In the fall certain groups of flowers and vegetables are studied. In the following spring the seeds of these same flowers and vegetables are suggested for planting. In the fall some bulbs are studied and planted both indoors and outdoors. In the winter and spring the flowers which develop from these bulbs are studied.

Such a large proportion of the Minnesota school year comes during the cold months, that special plans should be made to improve the opportunity offered during the first half of the fall term and the last half of the spring term to study plants and animals in their outdoor activities. In order that the greatest advantage may be taken of these seasons, a brief seasonal outline of topics is given for the fall and spring terms, immediately following the main outline, suggesting the order in which the various topics may most effectively be studied.

Age of Child—In the assignment of topics according to age, which is the fundamental consideration; for the primary grades those plants and animals have been chosen which the children could most naturally and easily be lead to observe, on account of their bright colors, size, activities, or common occurrence. The chief emphasis is placed on identification.

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In the intermediate grades the plants and animals have been classified into groups based on their habitat and habits. Identification still remains a prominent factor as in the primary grades, but to this are added the idea of adaptation of plants and animals to their surroundings and their classification into groups as mentioned above. Children's plays and sports have been made the center around which some simple studies in physics have been grouped.

In the grammar grades the general thought is the relation of these various phases of nature-study to human welfare. Two centers have been chosen around which to group these topics, the home in the seventh grade, and community life in the eighth grade.

In connection with the various topics in the outline there have been suggested corresponding children's problems which may serve as the central thought of the lesson, suggesting the points to be considered.

For each grade one type lesson is given, based on one of these problems, giving the points of the development and the application to be made by the child. These lessons are grouped together at the end of the outline.

Criticism and correspondence from any into whose hands this outline may come will be gratefully received.

Brief Synopsis of Outline

In order that the general plan and organization of the outline may be seen at a glance, below is given a brief synopsis of the detailed outline found in the pages following:

First Grade

Fall

I. Nature's Autumn Colors.
Flowers; nasturtium, wild sun flower; colored leaves; maple and box elder.

II. Preparation for Winter.
Food, gardens, seeds, animal preparation.

III. Seasonal Changes.
Approach of autumn and winter, weather records.

Winter

I. Holiday Studies.
Christmas dinner, trees, flowers.

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II. Home Studies.
Pets, the cat.

III. Health Studies.
Foods, air, bathing, clothing.

IV. Weather Studies.
Weather records, uses of ice and snow.

Spring

Central thought: the returning spring

I. The Awakening Trees.
Maple, box elder, pussy willow and poplar.

II. The Awakening Flowers.
Dandelion, Jack-in-the-pulpit.

III. The Awakening Seeds; Lima bean, dwarf nasturtium.
Schoolroom gardening, school gardens, home gardens.

IV. The Returning Birds.
Robin, bluebird.

V. New Life Among Animals.
Hen and chickens.

VI. The Changing Season.
Wind, rain, changes in brook, weather records.

Second Grade

Fall

I. Nature's Autumn Colors.
Flowers; goldenrods, thistle; colored leaves, elm, linden.

II. Animal Activities.
Spider, grasshopper, cricket.

III. Preparation for Winter.
Food, gardens, seeds, animal preparation.

IV. Seasonal Changes.
Approach of autumn and winter, weather records.

Winter

I. Holiday Studies.
Christmas dinner, trees, flowers.

II. Home Studies.
Pets, the dog.

III. Health Studies.
Air, bathing, clothing.

IV. Weather Studies.
Weather records, farms of ice and snow.

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Spring

Central thought: the returning spring

I. The Awakening Trees.
Elm, Linden.

II. The Awakening Flowers.
Hepatica, spring beauty.

III. The Awakening Seeds; pea, radish, climbing nasturtium.
Schoolroom gardening, school gardens, home gardens.

IV. The Returning Birds.
Red-winged blackbird, Baltimore oriole, chimney swift.

V. New Life Among Animals.
Toad's eggs.

VI. The Changing Season.
Signs of spring, changes in brook, weather records.

Third Grade

Fall

I. Nature's Autumn Colors.
Flowers, the asters; colored leaves; oaks, fruit trees.

II. Animal Activities.
Mosquitoes.

III. Preparation for Winter.
Food, gardens, seeds, animal preparation.

IV. Seasonal Changes.
Approach of autumn and winter, weather records.

Winter

I. Holiday Studies.
Christmas dinner, trees, flowers; Christmas dinner for the birds.

II. Home Studies.
Child's home, homes of animals.

III. Health Studies.
Food, air, bathing, clothing.

IV. Weather Studies.
Weather records, freezing, evaporation, condensation.

Spring

Central thought: the returning spring

I. The Awakening Trees.
Oaks and fruit trees.

II. The Awakening Flowers.
Violets.

III. The Awakening Seeds; corn, zinnia.
Schoolroom gardening, school gardens, home gardens.

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IV. The Awakening Animals.
Moth from cocoon; turtles.

V. The Returning Birds.
Scarlet tanager, rose-breasted grosbeak, house wren; nesting house for wren; Audubon bird club.

VI. New Life Among Animals.
Ways of hatching hen's eggs.

VII. The Changing Season.
Signs of spring, changes in brook, weather records.

Fourth Grade

Fall

I. Garden Studies.
Cultivated flowers-hardy annuals; bulbs; root vegetables.

II. Plants in Nature's Garden.
Flowers of shady places; mushrooms; nut trees.

III. Some Animal Friends and Foes.
Earthworms; insects—social insects, insect activities.

IV. Aquarium Studies.
Fishes.

V. Fall Sports.
The swing and slide.

Winter

I. Plants in Winter.
Shapes of trees; winter decorations.

II. Health Studies.
Food, air, sleep, the eyes, lighting the home.

III. Christmas Toys.
Motor, magnet, steam engine, flying machines.

IV. Winter Sports.
Coasting.

V. Sky Studies.
The sun.

Spring

I. The Awakening Life of Spring.
Nut trees; brightly colored wild flowers; cultivated flowers from bulbs.

II. The Returning Life of Spring.
Birds of the door yard and shade trees of Mankato; fountains; nesting houses for wren; Audubon bird club.

III. Gardening; hardy annual flowers, and root vegetables.
Schoolroom gardening, school gardens, home gardens.

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Fifth Grade

Fall

I. Garden Studies.
Tender annual flowers; bulbs; house plants; vegetables whose fruits or seeds are eaten.

II. Plants in Nature's Garden.
Flowers that grow in sunny places; ferns; shade trees of Mankato; plants that move.

III. Some Animal Friends and Foes.
Water insects, fly; spiders; crayfish.

IV. Some Plant Foes.
Poisonous plants.

V. Aquarium Studies.
Scavengers of the aquarium-snail and tadpole.

VI. Fall Sports.
Giant stride and teeter.

Winter

I. Plants and Animals in Winter.
Bark of trees, winter decorations, winter birds.

II. Health Studies.
Drinks, food, breathing, clothing, skin.

III. Winter Pleasures.
Outdoor sports; evening entertainments.

IV. Sky Studies.
The moon.

Spring

I. The Awakening Life of Spring.
Shade trees; white spring flowers; cultivated perennial flowers.

II. The Returning Life of Spring.
Birds of the air; nesting houses for wren and bluebird; nesting habits, Audubon bird club.

III. The New Life of Spring.
Frog's eggs.

IV. Gardening; tender annual flowers and vegetables whose leaves are eaten.
Schoolroom gardening, school gardens, home gardens.

Sixth Grade

Fall

I. Garden Studies.
Vines; vine crops; flowers from spring planted bulbs; planting fall bulbs; fruit trees; weeds of the garden.

II. Plants in Nature's Garden.
Vines; shrubs; mosses and lichens; tree fruits; fruits for winter birds.

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III. Some Friends and Foes of the Garden.
Insects, birds, toad.

IV. Aquarium Studies.
Water Plants.

V. Fall Sports.
Bicycling.

Winter

I. Plants and Animals in Winter.
Buds of trees, winter decorations; birds.

II. Health Studies.
Foods; heating and ventilation; clothing; avoiding disease; the blood system; accidents.

III. Christmas Studies.
Evergreens of Mankato.

IV. Winter Sports.
Roller skating.

V. Sky Studies.
The stars and planets.

VI. Some Simple Machines That Make Man's Work Easier.
Pulley, screw, wedge.

VII. How Glass Helps People.
Spectacles, opera glasses, camera.

VIII. Helps in Being Prompt.
Watches and clocks; school electric bell; old methods of telling time.

Spring

I. The Awakening Life of Spring.
Fruit trees, cultivated shrubs.

II. The Returning Life of Spring.
Birds of the meadows and fields; and of marshes; bird enemies; work of Audubon society.; migration; open nesting houses; Audubon bird club.

III. Gardening; Vines and vine crops.
School room gardening, school gardens, home gardens.

IV. Spring Sports.
Outdoor toys, as kite, windmill, water wheel.

SEVENTH GRADE

Central thought for the grade: The Hygiene and Science of the Home

Fall

I. Making the Home Yard Attractive.
Shrubs, vines, flowers.

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II. Making the Yard Useful.
The vegetable and fruit gardens.
III. Insect Pests of the Household.
IV. Heating the Home.
V. Ventilating the Home.

Winter

I. Lighting the Home.
II. The Home Water Supply.
III. The Food Supply.
IV. Entertainment in the Home.
Musical instruments.

Spring

I. Making the Yard Attractive.
Shrubs, vines, flower garden.
II. Making the Yard Useful.
Vegetable and fruit gardens; bee-keeping; poultry-keeping.
III. Enemies of the Garden; injurious insects.
IV. Friends of the Garden.
Beneficial insects; toads, birds, attracting birds around the home, bird songs and plumage.
V. Soils of the Garden.

EIGHTH GRADE

Central thought for the grade: The Sanitation and Science of Community Life

Fall

I. Insects That Threaten Health.
Fly and mosquito.
II. Insects in Relation to Growing Crops.
Insect foes; insect friends.
III. Plant Enemies of Crops.
Weeds; fungous diseases.
IV. Forest Trees.
V. Means of Travel.
On land; on water; in the air.
VI. Means of Communication.
Telephone and telegraph.

Winter

I. Public Health and Sanitation.
Board of health; milk supply; food supply; water supply; contagious diseases; sewage disposal; parks and playgrounds: fire protection; care of streets; lighting.

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II. School Hygiene.

Ventilation and heating; lighting; drinking fountains; playgrounds; medical inspection.

Spring

I. Forestry.

Uses of forests, decrease; enemies; forest control; reservations; conservation; Bureau of Forestry; Minnesota state forest service, tree planting on prairies; uses and structure of woods; work of the parts of a tree.

II. Bird Friends of the Forests.

Special study of birds of the woods; economic value of birds; adaptations in the structure of birds; enemies; work of national government to protect birds.

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DETAILED OUTLINE BY TOPICS AND PROBLEMS

Arranged according to Grades and Seasons

First Grade

Fall

I. Nature's Autumn Colors.

1. Gathering wild flowers; excursion to gather bouquet for schoolroom; group according to color; flower games; make flower chart. Special study of wild sunflower.
2. Flowers from home and school gardens; compare with colors of wild flowers; make booklet "Mother's Garden."
3. Special study of dwarf nasturtium, the garden flower suggested for spring planting.

Problems—

How many different colors can we find among the flowers that grow around here?

Have the garden flowers the same colors as the wild flowers?

How can we tell the nasturtium the next time we see it? (See type lesson, page 163).

How can we have more nasturtiums for next year?

4. Autumn coloring of leaves.
   - A. Gather a variety of colored leaves; group according to color.
   - B. Special study of maple and box elder.

Problems—

How many different colors can we find among the autumn leaves?

How can we tell a maple tree from a box elder tree?

II. Preparation for Winter.

1. Food for the winter.
   - A. Study of vegetables grown around Mankato:
   - B. Trip to grocery store: names of fruits and vegetables seen; note farmer's wagons.

Problems—

What vegetables that we eat were grown around Mankato?

How do they grow in the garden?

Which vegetables grow on top of the ground and which in the ground?

How do the vegetables get from the farmer to the grocer?

2. Provision for winter and spring gardens.
   - A. Indoor planting of Chinese lily bulb in water.
   - B. Outdoor planting of daffodil.

Problems—

How can we have flowers of the Chinese lily in our schoolroom before Christmas?

How can we have early spring flowers outdoors?

3. The seeds for next year.
   - A. Treasure boxes—fruits and vegetables.
   - B. Nature's seed sowing—seeds that fly.

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Problems—

What kind of seeds can we find in the fruits and vegetables that we eat?

How are some seeds made so that they can fly?

4. Animal preparation for winter.
   - A. The squirrel gathering his winter store.
   - B. Caterpillars spinning cocoons; rear caterpillars in school room.
   - C. The fish in winter quarters—aquarium studies.

Problems—

How does the squirrel get ready for winter?

We will watch these caterpillars and see what they do.

What care will the fish in our aquarium need this winter?

III. Seasonal Changes.

1. The approach of autumn—first week of term. Chart—"autumn work and play."
2. The approach of winter—last week of term. Booklet—"getting ready for winter."
3. Trip to Sibley Park; animals of the Park.
4. Weather records kept for one month (October). Pictorial records on large cards showing sunny days, cloudy days, rainy days, windy days.

Problems—

What signs do you see that autumn is coming?

What signs do you see that winter is coming?

Topics arranged in seasonal order

September	October	November
Approach of autumn	Rear caterpillars	Weather records
Wild flowers	Plant daffodil	Vegetables
Plant lily bulb	Seeds that fly.	Squirrel.
Cultivated flowers.	Trees.	Fish.
Trip to Sibley Park.	Treasure boxes.	Approach of winter.

Winter

I. Holiday Studies.

1. Christmas dinner.
   - A. Local products.
   - B. Special study of turkey and pumpkin.
2. Christmas trees—the pine.
3. Flowers for the Christmas table; Chinese lily from bulb planted in the fall.

Problems—

What can we get for our Christmas dinner from Mankato farms?

How do people raise turkeys?

How can we make a Jack-o-lantern?

How can we tell a pine from other Christmas trees?

What has happened to this bulb since we planted it last fall?

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II. Home Studies.

Care of pets—the cat.

Problem—

How can we take the best care of our pet cats?

III. Health Studies.

1. Foods that help make children strong. The cow as source of milk, butter and cheese. Make butter in schoolroom. Make a "Good Breakfast" chart.
2. Fresh air; games played outdoors; how to get fresh air in schoolroom.
3. Bathing. Children make individual "Keep Clean" charts.
4. Clothing—special study of cotton and woolen goods.

Problems—

How does the cow help us to get foods?
How should people take care of their cows?
How do we get fresh air in the schoolroom?
Why should we keep our face and hands clean?
Where did your apron come from?
Where did your winter dress come from?

IV. Weather Studies.

1. Weather records, kept for one month (January). (See fall outline).
2. Uses and forms of ice and snow.

Problems—

How does Jack Frost make us happy?
What kind of pictures does Jack frost paint?
Let us make a chart showing Jack Frost's work.

Spring

Central thought: The Returning Spring

I. The Awakening Trees.

1. Study of twigs of box elder and maple kept in water indoors.
2. Study of development of buds outdoors; flowers of soft maple.
3. Special study of pussy willow and pussy poplar.
4. Maple sugar.

Problems—

What can we find on the twigs of the box elder and maple?
When the buds open what can you see coming out of the buds?
Why do you like the pussy willow?
Where does maple sugar come from?

II. The Awakening Flowers.

1. Daffodils from bulb planted in fall.
2. Calendar of wild flowers.
3. An excursion for flowers for the May basket?
4. Special study of dandelion and Jack-in-the-pulpit.

Problems—

Why do you like the daffodil?
What colors did you find for your May basket?

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How can you tell the dandelion from other flowers?
Why do you think Jack-in-the-pulpit is an interesting flower?

III. The Awakening Seeds.
1. Schoolroom gardening.
A. Plant seeds of dwarf nasturtium and Lima bean.
B. Experiments with seeds and seedlings.
What do seeds need to grow?
Will seeds grow better in dirt or water? In dry or moist dirt?
What effect does soaking have on seeds?
2. School gardens. Plant nasturtium and Lima bean.
3. Home gardens.
A. Cleveland order envelopes of penny packets of seeds distributed.
B. Lessons on planting a few common seeds. Home gardens visited by teacher.

Problems—
We will start a little garden indoors and plant the nasturtium and bean seeds, so we can see how they grow.
We will learn how to plant radish seeds, so that you can plant them at home.

IV. The Returning Birds.
1. Bird calendar.
2. Bird walks.
3. Special study of robin, bluebird, and bank swallow.
4. Meetings of Audubon bird club.

Problems—
How can we tell the bluebird when we see it?
Why do you like the robin?
How are the bank swallows that nest back of our school different from the robin in the way they live?

V. New Life Among Animals.
Study of hen and chickens.

Problem—
How does a hen care for her chickens?

VI. The Changing Season.
1. The wind. Make a windy scene in a box.
2. Spring rains.
3. Weather records for a month (April). Decorate margin of pictorial record with pictures of signs of spring.
4. Changes in the brook. Make a "growing" picture of the brook, adding drawings of new life that appears.
5. Lessons at beginning and end of term on changes in seasons.

Problems—
Of what use is the wind?
Why do you like a rainy day?
How is the brook different now than it was a few weeks ago?
What signs do you see of the coming of spring?

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Seasonal Order of Topics

March	April	May
Distribute seed envelopes.	Weather record.	Jack-in-the-pulpit.
The wind.	Spring rains.	Bank swallow.
Change of seasons.	Flower of soft maple.	Hen and chickens.
Twigs of trees.	Changes in brook.	Bird walks.
Plant seeds indoors.	Robin.	Daffodil.
Experiments with seeds.	Pussy willow.	Excursions for flowers.
Bird calendar started.	Lessons on home-gardens.	Change of seasons.
Maple sugar.	Flower calendar.	
	Dandelion.	
	Bluebird.	

Second Grade

Fall

I. Nature's Autumn Colors.
   1. Gathering wild flowers. Looking for new flowers. A flower card for each new flower hung in room.
   2. Special study of goldenrod and thistle.
   3. Flowers from home and school gardens; use in schoolroom.
   4. Study of climbing nasturtium, the garden flower suggested for spring planting.

   Problems—

   How can we tell the goldenrod from other flowers?
   Why do you like the nasturtium?

   5. Autumn coloring of leaves.
      A. Study of coloring of leaves of trees on school grounds.
      B. Special study of elm and linden.

   Problems—

   How many different colors can we find on the leaves of trees growing on the school grounds?
   How can we tell the elm and linden trees apart?

II. Animal Activities.
   1. Grasshopper and cricket; keep indoors in cage.
   2. Spiders; special study of webs.

   Problems—

   We will watch the grasshopper in the cage to see how many different ways of moving it has.
   We will watch the cricket to see how it makes its song.
   What kinds of webs do spiders make?

III. Preparation for Winter.
   1. Food for the winter.
      A. Study of home grown fruits.
      B. Trip to grocery store. Canned fruits and vegetables.

   Problems—

   What fruits that we eat are raised in Minneosta?
   What canned goods are put up in Minnesota?

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2. Provision for winter and spring gardens.
   A. Indoor planting in soil and water of bulb of paper white narcissus.
   B. Outdoor planting of crocus.

Problems—

How can we have some flowers in our room next winter?
How can we get some early spring flowers outdoors?

3. Seed for next year.
   A. Seeds from home and school gardens stored.
   B. Nature's seed sowing—seeds that steal a ride?

Problems—

What seeds from our garden can we save to plant next spring?
How are some seeds made so that they can steal a ride?

4. Animal preparations for winter.
   A. The rabbit in the fall; his winter quarters.
   B. Animals in Sibley Park.
   C. Fish in winter quarters; aquarium studies; need of plant life.

Problems—

What is the rabbit doing this fall?
How do the animals in Sibley Park spend their winter?
What care must the keepers give them?
Why do we keep plants in the aquarium?

IV. Study of Seasonal Changes.
   1. Approach of autumn—first week of term. Autumn pictures painted. Highland Park in autumn; compare with spring.
   2. Approach of winter—last week of term. Winter landscape painted
   3. Trip to Sibley Park; animals of the Park.
   4. Weather records for one month (September). Records in writing on blackboard or chart showing temperature, winds, clouds, interesting weather happenings.

Problems—

How does Highland Park now differ from the way it looked last spring?
What signs do you see that winter is coming?

Seasonal Order of Topics

September	October	November
Weather records	Spider	Fruits
Approach of autumn	Grasshopper.	Plant narcissus bulb.
Wild flowers.	Cricket.	Rabbit.
Cultivated flowers.	Plant crocus.	Fish.
Trip to Sibley Park.	Seeds that steal a ride.	Approach of winter.
	Storing seeds.	
	Trees.	

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Winter

I. Holiday Studies.
   1. Christmas dinner.
      A. State products.
      B. Special study of nuts and fruits of Minnesota.
   2. Christmas trees—spruce and red cedar.
   3. Flowers for the Christmas table; paper white narcissus from bulb planted in the fall.

   Problems—
   What kinds of nuts grow in Minnesota?
   How do people raise fruits in this state?
   Why does the spruce make a good Christmas tree?
   How can we tell a red cedar tree from other Christmas trees?
   Why is it nice to have this narcissus flower in the room?

II. Home Studies.
   1. Home of Esquimaux children.
   2. Care of pets—the dog.

   Problems—
   How do the homes of the Esquimaux children differ fromyour homes?
   To what extent can the dog take care of himself?
   What care should I give my dog? (See type lesson, page 163).
   How many kinds of dogs are there?
   Of what use are dogs?
   What are some of the wild animal cousins of the dog?

III. Health Studies: how to keep well and strong in winter.
   1. Fresh air; how to get fresh air indoors at home.
   2. Bathing; need of keeping hands clean.
   3. Clothing—study of silk and leather.

   Problems—
   How can we get fresh air in our homes?
   Why should we wash our hands before eating?
   Where did your new silk tie come from?
   How are our shoes made?

IV. Weather Studies.
   1. Weather records for one month (December). Written records on chart or blackboard. (See fall outline).
   2. Uses and forms of snow and ice. Charts: Work Which Snow Makes; Work Which Snow Helps; Fun Which the Snow Brings.

   Problems—
   How does snow help people?
   What fun does the snow bring us?

Spring

Central thought: The Returning Spring

I. The Awakening Trees.
   1. Study of twigs of elm and linden kept in water indoors.
   2. Study development of buds of these trees outdoors.

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3. Flower of elm and linden.

Problems—

How do the twigs of the elm and linden differ?
Which comes out first on these trees leaves or flowers?
How are the flowers of the elm different from the other spring flowers?

II. The Awakening Flowers.

1. Crocus from bulb planted in the fall.
2. Calendar of spring wild flowers.
3. Excursion for flowers for May basket.
4. Special study of hepatica and spring beauty.

Problems—

How can we tell the crocus from other spring flowers?
Why do you like the hepatica?
How can you tell the hepatica and spring beauty apart?

III. The Awakening Seeds.

1. Schoolroom gradening.
   - A. Plant indoors seeds of pea, radish, and climbing nasturtium.
   - B. Egg shell garden-plant seeds of peppergrass in egg shells.
   - C. What do plants need to grow? (answer by experiments).
     - a. Do plants need water?
     - b. Do plants need light?
2. School garden, Garden notebooks illustrated by drawings.
3. The home garden.
   - A. Distribute Cleveland seed envelopes for penny packets.
   - B. Encourage children to plant seeds mentioned above (III, I, A).
   - C. Lesson on how to get the garden ready and how to plant these seeds.
   - D. Write for garden catalogs.

Problems—

We will plant some radish seeds to see if we can raise some radishes indoors before school closes.
How shall we get our garden ready at home for planting seeds?

IV. The Returning Birds.

1. Bird Calendar.
2. Bird walks.
3. Special study of red-winged blackbird, Baltimore oriole, and chimney swift.
4. Building nesting houses for the wren.
5. Organization of Audubon Bird Club, and meetings thru term.

Problems—

How can we tell each of these birds when we see them outdoors?
How does the swift differ from the oriole in its habits?
Which do you think is the most interesting bird?
What kind of a house shall we build for the wren?
Why would it be nice for us to form a Bird Club?

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V. New Life Among Animals.
   1. Development of toad's eggs.
   Problem—
   What happens to the toad's eggs as they grow?

VI. The Changing Season.
   1. Signs of spring. Booklet—Pictures of all the new happenings outside.
   2. Weather records for a month (March). Written records on blackboard or chart (See fall outline).
   3. Study of changes in brook. Animal life in the brook. Picture of the brook in March and May.
   Problems—
   Who has seen the greatest number of signs of spring?
   What animals live in our brook?

Seasonal Order of Topics

March	April	May
Give out seed envelopes.	Bird calendar.	Toad's eggs.
Weather records.	Flowers of elm.	Swift.
Signs of spring.	Bird houses.	Oriole.
Twigs of trees.	Bird club.	Excursion for flowers.
Plant seeds.	Flower calendar.	Bird walks.
Experiments with plants.	Hepatica.	
Changes in brook.	Home garden.	
	Spring beauty.	
	Crocus.	

THIRD GRADE

Fall

I. Nature's Autumn Colors.
   1. Gathering wild flowers—excursions. Recall old flowers; add new ones.
   2. Special study of the different kinds of wild asters; flower cousins, wild and cultivated asters.
   3. Comparison of fall and spring flowers.
   4. Gathering flowers from home and school garden; method of raising them.
   5. Special study of zinnia, the garden flower suggested for spring planting.
   6. Insects seen around flowers—butterflies, bees.
   Problems—
   What new flowers can you find this fall?
   How many different kinds of asters can we find growing around here this fall?
   How are the wild and cultivated asters alike?
   How do the flowers we see now differ from those we saw last spring?

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Why is the zinnia a good flower to grow in our gardens?
What do we have to do in order to get these flowers?
What colors do you find on butterflies?
Why do bees come to the flowers?

7. Leaf coloring.
   A. Study of coloring of leaves of trees growing along the streets and in the children's yards.
   B. Special study of fruit trees and oaks.

Problems—
How does the coloring on the different kind of trees growing in your yard differ?
How can we tell the different kind of oaks apart?
Of what use is the oak?
How can you tell the apple tree by its leaves?
Let us see how many different kind of apples we can collect?

8. Plants without flowers.
Ferns and mushrooms.

Problem—
How do ferns and mushrooms differ from our fall flowers such as goldenrod?

II. Animal Acitvities.
Mosquitoes; keep wigglers in tumbler.

Problem—
How do these wigglers live in the water?

III. Preparation for Winter.
1. Food for the winter.
   A. Study of fruits grown outside of Minnesota.

Problem—
What fruits that we eat are grown outside of Minnesota?
How do these fruits get to us?

2. Provision for winter and spring gardens.
   A. Raising plants from cuttings.
   B. Planting bulb of Dutch hyacinth indoors.
   C. Planting bulb of Dutch Hyacinth outdoors.

Problems—
We will learn a new way of getting flowers, that is by using cuttings.
How can we have flowers in our room next winter?
How can we have flowers outdoors in the spring?

3. Seed for next year.
Nature's seed sowing-seeds that shoot, and those scattered by birds.

Problems—
How are some plants fitted so as to shoot their seeds?
How do birds help scatter seeds?

4. Animal preparation for winter.
   A. The tadpole in winter quarters—aquarium studies.
   B. Special study of the deer in Sibley Park.

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C. Departure of birds; comparison with bird life in the spring; Bird Clubs meet to report on experiences with bird houses the previous summer.
D. The long winter sleep of animals.
Hibernation of toad, frog, snakes, turtles.

Problems—

What does the tadpole do in the aquarium?
What birds of the spring time are still here?
How do animals like the toads and frogs spend the winter?

5. Plant preparation for winter; trees, grasses, flowers.

Problem—

How do plants like trees, flowers and grasses get ready for winter?

IV. Seasonal Changes.

1. The approach of autumn—first week; written records.
2. The approach of winter—last week; written records.
3. Trip to Sibley Park; chart of trees in Park; changes in river.
4. Weather records for one month (November). Individual records in writing.

Problems—

Let us see who can write the longest list of things that show autumn is coming, or that winter is coming.

Seasonal Order of Topics

September	October	November
Wild flowers.	Flowerless plants.	Weather records.
Approach of autumn.	Seeds.	Fruits.
Cultivated flowers.	Trees.	Tadpole.
Mosquito.		Approach of winter.
Cuttings.		

Winter

I. Holiday Studies.

1. Christmas dinner; products from abroad.

Problems—

What are some of the things for Christmas dinner that come from other parts of the world than Minnesota?
How do they get to us?
What nuts do we get that are raised outside of Minnesota?

2. Christmas dinner for the birds. (Use old Christmas tree.)

Problems—

What kind of Christmas gifts do birds like?
What kind of birds will come to the feast?

3. Christmas greens.
   A. Christmas trees—evergreens of Mankato.
   B. Holly and mistletoe.

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Problems—

How can we tell the evergreens of Mankato apart?

Why are holly and mistletoe used for decorations?

4. Flowers for the Christmas table. Dutch Hyacinth planted in fall.

Problems—

What has happened to this bulb since we planted it?

Why has it been worth while to raise this flower?

II. Home Studies.

1. Child's home.
   - A. Warming the home—the thermometer.
   - B. Lighting the home (compare with primitive methods.)

Problems—

In how many different ways are our homes warmed?

How can we tell from the thermometer when the room is warm enough?

How do our ways of lighting our homes differ from the ways that were used many, many years ago?

2. Homes of animals.
   - A. Deserted homes—birds' nests.
   - B. Insect homes—galls, cocoons, nests of paper and mud wasps.
   - C. Pets—the horse.

Problems—

Of what materials do birds make their nests?

Of what kind of materials are insect homes made?

How are insect homes made?

Of what use is the horse?

How many different kinds of horses are there?

What care should the horse have in winter?

III. Health Studies.

1. Foods that help keep one well and strong. Emphasize the sources; the industrial relations.
2. Fresh air; need of, how get in sleeping room.
3. Bathing; cold and warm water baths.
4. Clothing—study of fur and linen.

   Classify clothing materials into plant and animal products.

Problems—

What are some of the foods that are good for us to eat?

How does an orange get to us?

Why do we need fresh air?

How can we get fresh air in our sleeping rooms?

Which is better the warm water or cold water bath?

How did your father get his fur coat?

Where did your handkerchief come from?

IV. Weather Studies.

1. Weather records for one month (February). Written individual records.
2. Condensation, evaporation, freezing.

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Problems—

How can we show that there is water in the air of this room?
What happens when water boils?
What harm is done by freezing water?
What good is done by freezing water?

Spring

I. The Awakening Trees.
   1. Study of twigs of oaks and fruit trees kept in water.
   2. Development of buds outdoors.
   3. Study of flowers of fruit trees.
   4. Calendar of blossoming of trees.

   Problems—

   How can we tell these twigs apart before the leaves come out?
   Which appear first the leaves or blossoms on the oaks and fruit trees?
   What are the names of the parts of an apple blossom?

II. The Awakening Flowers.
   1. Dutch hyacinth from bulb planted in fall.
   2. Calendar of wild flowers.
   3. Excursion for wild flowers for May basket.
   4. Special study of dog-toothed violet and the blue, white, and yellow violets.

   Problems—

   What do you like about this hyacinth flower?
   How may the different violets be told apart?
   Of what use is each part of the violet flower?

III. The Awakening Seeds.
   1. Schoolroom gardening.
      A. Plant indoors seeds of corn and zinnia.
      B. Experiment to show use of cotyledon of pea to seedling.
   2. School garden; plant corn and zinnia; garden notebooks.
   3. Home gardens.
      A. Distribute Cleveland order envelopes for penny packets of seeds.
      B. Lesson on home gardens; use, care; gardens visited by teacher.
      C. Charts showing pictures of, Flowers Easily Grown and Vegetables Easily Grown. Reports on father's garden.

   Problems—

   We will plant seeds of corn and zinnia so as to watch the plants and see how fast they grow.
   Why would you like to have a garden?
   What must you do if you wish to have a garden this spring?

IV. The Awakening Animals.
   1. Turtles, frogs, snakes.
   2. Development of moth from cocoons collected in fall and winter or from the caterpillars reared in fall.

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Problems—

How do turtles differ from other animals that you know?

How is this moth (or butterfly) different from other insects that you know such as the grasshopper?

V. The Returning Birds.

1. Bird calendar; name of bird, date first seen, name of child first reporting.
2. Bird walks.
3. Special study of house wren, scarlet tanager, and rose-breasted grosbeak.
4. Building nesting houses for the wren.
5. Audubon Bird Club organized and meetings held thru term.

Problems—

Which do you think is the prettier bird the tanager or grosbeak?

How can we tell these from other birds?

Why would you like to have a wren nest around your home this summer?

What kind of a house shall we make for a wren to nest in? (See type lesson, page 164).

What can our Bird Club do to help the birds?

VI. New Life Among Animals.

Methods of hatching hen's eggs.

Problem—

Which is the better way of hatching eggs to use an incubator or let the hen do it?

VII. The Changing Season.

1. Signs of spring. Collection of pictures, making booklet to show spring's return.
2. Weather record for one month (May). Individual record kept in writing.
3. Changes in brook. Visit brook. Note changes included in signs of spring. Pictures of brook in March and May.

Problems—

Let us make a collection of pictures to show signs of spring.

How does the brook in May look different than it did in March?

Seasonal Order of Topics

March	April	May
Give out seed envelopes.	Bird calendar.	Weather record.
Twigs of trees.	Start bird club.	House wren.
Plant seeds indoors.	Lessons on home garden.	Moth.
Signs of spring.	Calendar of tree flowers.	Grosbeak.
Use of food in pea.	Turtles.	Hyacinth.
Changes in brook.	Flower calendar.	Flowers of fruit trees.
	Violets.	Tanager.
	House for wren.	Excursions for flowers.
	Hatching eggs.	Bird walks.
		Changes in brook.

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Fourth Grade

Fall

I. Garden Studies.

1. Cultivated flowers—hardy annuals, such as bachelor's button, candytuft, nasturtium, phlox, California poppy, sweet alyssum petunia, zinnia.

Problems—

Which would you prefer to have in your garden the nasturtium or bachelor's button? (or comparison of any two flowers.)

What are the best ways of telling these flowers apart? (taking one or two at a time.)

Why do you like the nasturtium?

Which of these flowers are not killed by the first severe frosts?

2. Planting bulbs.

A. For outdoor planting—tulips (single, double, Darwin, parrot); daffodils (single, double); jonquils (single, double). (Plant in school garden and encourage the children to plant at home.)

B. For indoor blooming during the winter—double jonquil or daffodil.

Problems—

How may we get flowers in the early spring?

How may we have flowers in the schoolroom next winter? (See type lesson, page 164.)

3. Vegetables whose roots are eaten; such as beet, carrot, oyster, plant, parsnip, turnip, kohlrabi, celeriac.

Problems—

How are root vegetables grown?

Which of these makes the best kind of food?

In what ways are these vegetables cooked?

II. Plants in Nature's garden.

1. Flowers that grow in shady places such as, wood aster, tall bell flower, boneset, cone flower, elm leafed goldenrod, white lettuce, white snakeroot, woodland sunflower, touch-me-not, lobelia.

Problems—

What is the best way of telling each of these flowers from other flowers?

Which do you like the better of any two of these flowers?

2. Plants without flowers.

Mushrooms.

Problem—

How do the various mushrooms differ from each other?

3. Nut trees; such as butternut, walnut, hickories, oaks. Keep calendar of coloring and fall of leaves.

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Problems—
How can we tell the oaks apart by their leaves?
How do the acorns of the oaks differ?
What use is made of the wood of oak trees?
How can we tell a butternut from a walnut tree?

III. Some Animal Friends and Foes.
1. Social insects, such as ants, bees, wasps.
2. Insect activities; how they eat, breathe and move.
Problems—
In what ways is the life of social insects like the social life of human beings?
How do insects eat?
In how many ways do insects move?
How does the insect's way of breathing differ from our way?
3. Earthworms.
Problem—
In what ways are earthworms helpful to man?
4. Squirrels.
Problems—
What makes squirrels interesting animals to have around?
How many kinds of squirrels are there?

IV. Aquarium Studies—fishes; fishes used as food, native fishes.
Problems—
How does the fish use its fins in swimming?
How does its method of breathing differ from that of the frog?
To what extent do we use fishes for food in Mankato?
What fishes are found around Mankato?

V. Fall Sports.
1. The swing; other applications of the pendulum, such as the clock. Simple experiments showing relation of length, weight and arc to time of vibration.
2. The slide; other applications of the inclined plane, such as coal slide, plank for loading wagon, sliding down hill.
Problems—
What principles of the pendulum are illustrated in the swing?
What other applications of the pendulum can you find?
What other applications of the inclined plane can you find beside the swing?

Seasonal Order of Topics

September	October	November
Wild flowers.	Cultivated flowers.	Squirrels.
Soft mushrooms.	Insects.	Bulbs—indoors.
Cultivated flowers.	Bulbs—outdoors.	Fish.
	Earthworm.	Vegetables.
	Trees.	Woody mushrooms.
		Swing and slide.

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Winter

I. Plants in winter.
   1. Winter decorations—flower of jonquil or daffodil planted in fall.
   2. Shapes of trees.

   Problems—
   What makes this an attractive plant to have in the schoolroom?
   How do trees differ in their shape?

II. Health Studies; how to keep the body well and strong.
   1. Foods.
      Foods that are good for children. Emphasize the use of plain, simple foods such as fruits, vegetables, meats, cereals.
      Foods that are not good for children. Emphasize the need of extreme caution in using such foods as rich cakes, pastries, fatty meats, rich puddings.
      For each food discuss its sources, means by which it reaches the table, final preparation for table, value as food.
      Need of thoro chewing, care of teeth, different sets of teeth.

   Problems—
   What are the most wholesome foods for us to eat?
   What are some of the foods that it is better to leave alone or eat only small portions of?
   Why should we take good care of our teeth?
   How can we take good care of our teeth?

   2. Air; uses in motion, to sail boats, turn windmills, dry clothes, keep one comfortable in summer.
      Uses when quiet; to make fires, lamps, and gas jets burn; use to animals, plants, and people in breathing.

   Problems—
   Of what use is air when in motion?
   Of what use is air when quiet?

   3. Care of eyes.
      How to read, testing the eyes, use of glasses.

   Problems—
   In what ways should we be careful in using our eyes?
   How do spectacles help the eyes?

   4. Methods of lighting the home.
      Candle, lamp, gas, electricity.

   Problems—
   Which is the best way of lighting the home?
   How does the method of using gas differ from that of electricity?

   5. Sleep; providing rest for the body.
      Need of sleep, amount required, how to get fresh air in sleeping rooms.

   Problem—
   On what does the amount of sleep that one needs depend?

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III. Christmas toys; such as magnets, electro-magnet, motor, steam engine, air ships, gyroscope, compass.

Problems—

What power does the magnet possess that makes it useful?
How does the stem engine work?
How does an aeroplane differ from a dirigible balloon?
How does the compass work?

IV. Winter Sports.

Coasting.

Formation of snow, action of gravity on sled, increase in speed, other illustrations of action of gravity.

Problems—

How many different kinds of sleds are there?
Under what conditions does snow fall?
What other illustrations of the action of gravity can you think of?

V. Sky Studies.

The sun.

Its size, distance, motions, relation to earth.
Observations on its change in position at sunrise, noon and sunset; and on the change of time of sunrise and sunset.

Problems—

In what ways is the sun different from the earth?
What things that we do are influenced by the sun?

Spring

I. The Awakening Life of Spring.

1. Trees.
   A. Study of twigs of nut trees.
   B. Watch development of twigs kept in water indoors.
   C. Watch development of buds outdoors; keep record of dates when buds open.

Problems—

How can we identify each of these trees before the buds open?
What is there in the buds that develops into leaves and flowers?

2. Wild flowers.

Brightly colored flowers, such as, pasque flower, hepatica, wild ginger, bellwort, wild phlox, Jack-in-the-pulpit.

Problems—

Which do you like better the heaptica or wild ginger?
What makes the Jack-in-the-puplit an interesting flower?
How can we tell the bell wort from other flowers?
Of what use are the different parts of the phlox flower?

3. Cultivated flowers.
   A. Calendar of garden flowers.
   B. Study of flowers growing from bulbs.

Problems—

Which do you like best of the flowers that grow from bulbs?
What has been done to raise these flowers?

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II. The Returning Life of Spring.
Birds.
1. Calendar.
2. Changes in bird activities as the season advances.
3. Special study of the birds of the dooryards and shade trees of Mankato; such as blue jay, English sparrow, robin, bluebird, chipping sparrow, house wren, Baltimore oriole, yellow warbler.
4. Building nesting houses for the wrens.
5. Fountains for drinking and bathing.
6. Formation of Audubon Bird Club; meetings during term.

Problems—

What changes do you notice in bird activities as the season advances?
Is the English sparrow a nuisance or of value to us?
Of what use is the robin to us?
How is the oriole fitted for its life in the air and among the trees?
How can you tell the yellow warbler from the goldfinch?
What kind of a house shall we make so as to get a pair of wrens to nest in it?
How can we provide water for the birds during the summer?
Why would you like to form a bird club?

III. Gardening. Main topic; hardy annual flowers, and vegetables whose roots are eaten.

1. Schoolroom gardening.
   A. Early in the season plant indoors a few flower seeds and vegetable seeds from the lists given below under the school garden, so that later the seedlings may be transplanted in the home or school gardens.
   B. How plants use water (to be answered by experiments.)
      a. Taken by root.
      b. Passed thru stem.
      c. Given off thru leaf.
   C. Difference in the way the seedlings of corn and bean come thru the ground.

Problems—

How can we have early flowers and vegetables in our gardens?
What use do plants make of water?

2. The school garden.
   A. Plant seeds of some of the hardy annual flowers, such as sweet alyssum, bachelor's button, calliopsis, candytuft, nasturtium, California poppy, petunia, sunflower, zinnia.
   B. Plant seeds of some of the vegetables whose roots are eaten, such as beet, carrot, celeriac, kohlrabi, oyster plant, parsnip, turnip.
3. Home gardens.
   A. Distribute Cleveland order envelopes for penny packets of seeds.

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B. Encourage the children to plant some of the seeds mentioned above.

Lessons on the planting of these seeds and the subsequent care which these groups of plants require.

Problems—

Why would you like to have a garden at home?
How can root vegetables be raised?
How can the hardy annual flowers be raised?

Seasonal Order of Topics

March	April	May
Give out seed envelopes.	Robin.	Calendar of garden flowers.
Twigs of trees.	Bluebird.	Wren.
Plant seeds in room or cold frame.	How plants use water.	Later spring flowers.
Start bird calendar.	Lessons on home garden.	Oriole.
Blue jay.	First spring flowers.	Bird fountains.
English sparrow.	Chipping sparrow.	Flowers from bulbs.
Form bird club.	House for wren.	Yellow warbler.

Fifth Grade

Fall

I. Garden Studies.

1. Cultivated flowers—tender annuals; such as aster, balsam, calendula, cosmos, four-o'clock, marigold, portulaca, velvet flower.

Problems—

Which would you prefer to have in your garden marigold or cosmos?
How may each of these flowers be identified?
Why is the velvet flower a desirable flower to have in our gardens?

2. Planting bulbs.

A. For outdoor blooming; lilies and early spring flowers such as crocus, glory of the snow, snowdrop, blue bells. Plant in school garden and encourage children to plant at home.

B. For indoor blooming during the winter—lily of the valley or crocus.

Problems—

How can we have early flowers next spring?
How can we have flowers in the schoolroom next winter?

3. House plants.

Problems—

What plants will do well indoors?
What care do these plants require?

4. Vegetables whose fruit or seeds are eaten; such as tomato, egg plant, corn, peas, beans.

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Problems—

How are these vegetables raised?
How can these be kept for winter use?
Which of these make the best food?
Which can be raised most easily in a small garden?

II. Plants in Nature's Garden.

1. Flowers that grow in open, sunny places; such as asters, clovers, daisies, goldenrods, wild sunflowers, toadflax, thistles.

Problems—

How many different kinds of goldenrods can you find?
In what ways is the wild aster like the cultivated aster?
How is the toadflax made so as to bring about insect pollination?
How can we tell the kinds of clovers apart?

2. Plants without flowers.

Ferns—both wild and cultivated.

Problems—

How do the various ferns differ from each other?
What care do ferns as house plants require?

3. Shade trees of Mankato; such as maples, elms, linden, catalpa, box elder, hackberry, honey locust, white poplar.

Work of the parts of a tree, root, stem, leaf.

Problems—

Which is the best shade tree in Mankato?
Arrange the shade trees in the order of their occurrence on the streets that you are familiar with.
What care do shade trees require?
How can we tell the different maples apart?
What is the chief character by which each tree may be named?
What work is done by the root of a maple tree? By the stem? By the leaf?

4. Calendar of leaf coloring of trees, shrubs, and vines; Name of plant, color of leaf, date, name of child first reporting.
5. Plants that move.

Sensitive plant, white clover, mallow, sunflower, geranium.

Problems—

What kind of motion do the leaves and flowers of some plants have?
What causes these movements?

III. Some Animal Friends and Foes.

1. Spiders; orb weaver, grass spider, cobweb spider; value, web spinning habits.
2. Water insects, such as whirligig beetle, water strider, water boatman, backswimmer, water beetles, nymph of dragon fly; methods of moving and breathing.
3. Housefly, relation to disease.
4. Crayfish, habits, value.
5. Compare bird life now with that in spring.
6. Feeding winter birds.

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Problems—

How do spiders webs differ from each other?
Are spiders harmful or helpful?
In what ways is each of these water insects fitted for living in water?
What harm is done by the housefly?
What can be done to get rid of the fly?
What habits of the crayfish may be observed from a study of a crayfish kept in the schoolroom?
How do the activities of birds now differ from their activities last spring?
How may we help the winter birds?

IV. Some Plant Foes.

Poisonous plants, such as posion ivy, Jimson weed, pokeweed, poisonous mushrooms, Identification, nature of injury, remedies.

Problems—

How may we know these poisonous plants when we see them?
What harm does each plant do?
What is to be done in case of poisoning with any of these plants?

V. Aquarium Studies.

Scavengers—tadpole and snail.

Problem—

Of what use are tadpoles and snails in the aquarium?

VI. Fall Sports.

1. Giant stride; other illustrations of centrifugal force such as cream separator, clothes drier, flywheel, sling.
2. Teeter; other applications of the lever such as crowbar, hammer, pump handle, pantagraph, scales for weighing.
3. Value of exercise to the body; muscles of the body.

Problems—

What principles that are illustrated in the giant stride are applied elsewhere?
How do the various applications of the lever differ from that found in the teeter?
In what way is the exercise on these pieces of apparatus good for the muscles of the body?

Seasonal Order of Topics

September	October	November
Wild flowers.	Ferns.	Water insects.
Tender annuals.	Spiders.	Crayfish.
Start calendar of leaf coloring	Bulbs—outdoors.	Vegetables.
House plants.	Compare bird life with spring.	Feeding birds.
Housefly.	Trees.	Bulbs—indoors.
		Tadpole and snail.
		Stride and teeter.

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Winter

I. Plants and Animals in Winter.

1. Winter decorations—flower of lily of the valley or crocus.

Problem—

Which do you think adds more to the appearance of the room a flower like the lily of the valley or a foliage plant like the fern?

2. Tree studies.

A. Bark of trees.
B. Uses of trees and forests while standing.
C. Uses of the wood after the tree is cut down.

Problems—

How do the barks of trees differ?
Of what use are trees while standing?
What use s are made of the wood after the tree is cut down?

3. Winter birds; such as blue jay, English sparrow, nuthatch, chickadee, woodpecker, identification, feeding.

Problems—

What is the best way of telling the winter birds apart?
How can we help them in winter?

4. How animals spend the winter.

Problem—

In what different ways do wild animals spend the winter?

II. Health Studies.

1. Drinks.

Drinks that are harmful to children; tea, coffee, alcoholic drinks, patent medicines.
Drinks that are good for children.
Milk; its sources, uses, methods of keeping sweet and clean, products made from milk.
Water; use to the body, how it becomes unfit to drink, how made pure, public drinking cup and sanitary fountain; method by which rain forms.

Problems—

Why are patent medicines not good for sick people to use?
Why should not children use tea, coffee, or alcoholic drinks?
What makes milk such a good drink for children?
What care needs to be taken to be sure that our drinking water is clean?

2. Foods.

What children eat in other lands.
Comparison of food of animals with food of man.

Problems—

How does the food that children in other countries eat differ from the food you eat?
How does the food of animals differ from that of man?

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3. Breathing.
   How done, need of, frequency, lungs, lung capacity, breathing thru mouth and nostrils, artificial breathing in case of apparent drowning and gas suffocation.
   Effect on breathing of tight clothing, and of exercise.

Problems—
What takes place in our lungs while we are breathing?
What are some of the things that interfere with proper breathing?

4. Clothing.
   Purposes, dependence on season, how children in other lands are clothed.
   Animal coverings; hair, wool, fur, feathers, scales, skin, shell, silk.
   Ability of clothing material to conduct heat.

Problems—
How does the clothing of children in other lands differ from your clothing?
What health factors should determine the kind of clothing we wear?
What different kinds of coverings do animals have?

5. Care of skin.
   Bathing, kinds of baths, swimming.

Problems—
Of what value are the different kinds of baths?
What are the strokes commonly used in swimming?

II. Winter Pleasures.

1. Outdoor sports; skating, formation of ice; floating of ice; value to body of outdoor exercise.

2. Evening entertainments.
   Stereopticon, moving pictures, phonograph, talking movies.

Problems—
How many kinds of skates are there?
How does ice form?
How does a moving picture machine differ from a stereopticon?
How does the phonograph reproduce sounds?
What advantages have the talking movies over the phonograph or moving pictures alone?

IV. Sky Studies.

The moon; its size, distance, motions, relation to earth.
Observations on its phases, changes in position in sky; and changes in time of rising and setting.

Problems—
What effect does the moon have on man's life?
In what ways is the moon different from the sun. (See type lesson, page 165.)

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Spring

I. The Awakening Life of Spring.

1. Trees.

A. Leaf calendar.

B. Special study of shade trees of Mankato. Watch development of twigs kept in water indoors.

C. Flowers of maple and elm.

Problems—

What is the order in which the buds of our shade trees open?

How can we identify our shade trees before the buds open?

What is there in the bud that develops into leaf and flower?

How do the flowers of the elm and maple differ from other flowers that you know such as the hepatica?

2. Wild flowers.

A. Calendar.

B. Special study of white spring flowers, such as blood root, dwarf trillium, Dutchman's breeches, wild strawberry, toothwort.

Problems—

How does the flower of the bloodroot differ from the flower of Dutchman's breeches?

What is the best way of identifying each of these flowers?

How are these adapted to insect pollination?

Which do you like the better of any two of these flowers?

3. Cultivated flowers.

Study of spring flowering perennials such as columbine, iris, lily of the valley, peony, bleeding heart.

Problems—

Why are these desirable flowers to have in our garden?

What is necessary to do in order to have these flowers?

II. The Returning Life of Spring.

1. The birds.

A. Special study of birds of the air; such as rough winged swallow, bank swallow, martin, chimney swift, barn swallow, night hawk, humming bird.

B. Building nesting houses for bluebird and wren.

C. Study of nesting habits.

Nest, location, materials, construction; eggs; number, size color, incubation, young birds; care given by parents, time in nest; putting out nesting material.

D. Formation of Audubon Bird Clubs, meetings during term.

Problems—

In what ways are swallows fitted for living on the wing?

How can we tell the different swallows apart?

What can we observe about the nesting habits of the bank swallows that nest back of the building?

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Of what use are the swallows to us?
What makes bird houses a better protection to birds than their natural nesting sites?
How can we get some bird like the wren or bluebird to help us destroy the insects in our garden?
What materials do birds nests contain that we can put out for the birds to use?
Where do birds build their nests?
What care do the parent birds give their young?

III. The New Life of Spring.
Development of frog's eggs.
Problem—
What changes take place during the development of the frog's eggs?

IV. Gardening.
Main topic—tender annual flowers; and vegetables whose leaves are eaten.
1. Schoolroom gardening.
A. Early in the season plant indoors or in a cold frame a few seeds from each of the lists given below under 2, so that the seedlings may later be transplanted into the home or school gardens.
B. How plants grow (to be answered by experiments.)
a. Place of growth in root.
b. Place of growth in stem.
c. Growth of plants in darkness.
C. Work of root, stem and leaf of plant.
Problems—
How may we have early flowers and vegetables in our gardens?
In what part of the root does growth take place, in what part of the stem?
How does a plant growing in darkness differ from one growing in light?
2. The school garden.
A. Plant seeds of some of the tender annuals; such as aster, balsam, cosmos, four-o'clock, marigold, portulaca, velvet flower.
B. Plant seeds of some of the vegetables whose leaves are eaten, such as cabbage, celery, Swiss chard, cress, endive, lettuce, parsley.
3. Home gardens.
A. Distribute Cleveland order envelopes for penny packets of seeds.
B. Encourage children to plant some of the seeds mentioned above under 2. Lessons on the culture of tender annuals, flowers and of salad plants. Value of fresh vegetables for food.
C. Insects of the gardens.

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Problems—

How can tender annual flowers be raised?
How can salad plants be raised?
Why do vegetables that we raise in our own gardens make good food?
What do insects do in the garden?

Seasonal Order of Topics

March	April	May
Give out seed envelopes.	Organize Audubon Club.	Chimney swift.
Twigs of trees.	Lessons on home garden.	Barn swallow.
Plant seeds indoors.	Start flower calendar.	Later spring flowers.
House for bluebird.	Early flowers.	Night hawk.
Nests.	Martin.	Humming bird.
How plants grow.	House for wren.	Cultivated flowers.
Work of plants.	Frog's eggs.	Nesting habits.
	Start leaf calendar.	Insects of garden.
	Bank swallow.	
	Flowers of maple and elm.	

Sixth Grade

Fall

I. Garden Studies.

1. Cultivated flowers—vines.

A. Annual vines such as balloon vine, canary bird flower, hyacinth bean, cypress vine, gourd, Japanese hop, moon flower, morning glory, sweet pea.

B. Perennial vines such as bittersweet, clematis, Engelmann's ivy, Boston ivy, trumpet honeysuckle, everlasting pea, wistaria, woodbine.

Problems—

Which are better vines to grow in our yards annuals or perennials?
What support is needed for each kind of vine?
What uses are made of vines?
Which of these vines is the prettiest in the fall when the leaves are coloring?
Which is the more desirable vine to grow the morning glory or canary bird flower?

C. Flowers from spring bulbs; tuberose, gladiolus, dahlia.

Problem—

Which flower is better for decorating a yard gladiolous or dahlia?

2. Planting bulbs.

A. For outdoor blooming. Plant in school garden and encourage children to plant at home.
Hyacinths (single, double, grape, feathered, wood, Spanish.)

B. For indoor blooming.
Roman hyacinth.

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Problems—

What is the best way to plant fall bulbs?

How may we have flowers in our room next winter?

3. Vine crops, such as cucumber, melons, summer and winter squash, pumpkin, pollination of their blossoms; grape vine.

Problems—

How do the flowers of the pumpkin differ from each other?

Which of these fruits makes the best food?

How may some of these be stored for winter use?

In what respects are these fruits alike in structure?

4. Some common weeds of the garden; such as mallow, pigweed, lamb's quarters, purslane, quackgrass. Their identification and control.

Problems—

What are the most common weeds that grow in the garden?

How may they be identified?

How may each of these weeds be controlled?

5. Fruit trees and their fruits.

Apple, plum (both wild and cultivated), cherry (both wild and cultivated).

Problems—

How many different kinds of apples are there that grow around here?

How do the cultivated plum and cherry differ from the wild?

What harm is done to apple trees and apples by insects?

How may these insects be controlled?

II. Plants in Nature's Garden.

1. Vines; such as bittersweet, climbing buckwheat, clematis, wild cucumber, wild morning glory, wild grape, poison ivy, wild peanut, moonseed, smilax, woodbine.

Calendar of coloring and fall of leaves of vines both wild and cultivated.

Problems—

How may the wild vines be told apart?

Which of these vines have features which make them suitable for planting in the home grounds?

How do vines climb?

2. Flowerless plants.

Mosses and lichens.

Problems—

How do mosses differ from lichens?

3. Tree fruits still hanging on trees; such as ash, catalpa, cones of evergreens, red cedar, coffee tree, hornbeam, ironwood, box elder, linden, locust, sugar maple. Dispersal of tree fruits.

Problem—

What trees may be identified by means of the fruit hanging on them?

How are these tree fruits adapted for dispersal?

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4. Fruits that serve as food for the fall and winter birds; such as mountain ash, barberry, bittersweet, burning bush, hackberry, dogwood, smilax, snowberry, sumac, viburnum, identification of these shrubs from fruit and leaf.

Problems—

What kind of fruits do shrubs bear that birds like to eat?
How may these shrubs be identified?

III. Some Friends and Foes of the Garden.

1. Insect friends and foes; such as potato beetle, white grub, cutworm, cabbage worm, corn ear worm, bees, lady beetles, harm or good done, remedies for injurious kinds.

Problems—

What harm have insects done to the garden during the past summer?
In what ways have insects been helpful?

2. Bird friends; fall migration of birds; nest census (after fall of leaves.)

Problems—

How do the activities of birds now differ from their activities last spring?
Which are among the first birds to leave, and which stay the longest?
How many birds' nests can we find in the trees growing within two blocks of the school house?

3. Toad.

Problem—

What does the toad do for us?

IV. Aquarium Studies.

Water plants.
Problem.
How do plants that live in the water differ from those that live on land?

V. Fall Sports.

Bicycling, bicycle pump, compressed air.

Problems—

Which is the better bicycle the kind with or without chains?
What is the difference in the different makes of bicycles?

Seasonal Order of Topics

September	October	November
Flowers of spring bulbs.	Weeds.	Fruit trees.
Flowers of vine crops.	Vine crops.	Plant bulb indoors.
Annual cultivated vines.	Garden insects.	Tree fruits.
Perennial cultivated vines.	Mosses and lichens.	Nest census.
Wild vines.	Plant bulbs outdoors.	Fruits for birds.
Start vine calendar.	Fall migration of birds.	Bicycling.
Toad		Water plants.

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Winter

I. Plants and Animals in Winter.
   1. Winter decorations—flower of Roman hyacinth from bulb planted in fall.
   2. Tree studies.
      A. Buds of trees.
      B. Enemies of trees and forests.

Problems—
What makes the hyacinth a desirable flower to have in the room?
What trees can we name thru the difference in their buds?
What are the chief enemies of trees?

   3. How plants spend the winter.
   4. Winter Birds.
      A. Value of birds.
      B. Helping our bird friends by feeding them.

Problems—
What do birds do for us?
How can we help the winter birds?

II. Health Studies; keeping the body well and strong.
   1. Foods.
      A. Cooking, needs, ways.
      B. Preservation of foods; in ice chest, cellar, by canning, drying, salting.
      C. Difference in food according to seasons.
      D. Compare food of plants with food of animals.
      E. Digestion of foods, solubility, use by body.

Problems—
How does cooking make foods better?
In what ways may foods be kept from spoiling?
How does our food change from season to season?
How does the way in which plants get their food differ from the way in which animals get their food?
What happens to our food after it is swallowed?

   2. Heating and ventilation; how to get a supply of warm, fresh air.
      Ways of heating; fireplace, stove, hot air furnace, hot water, steam.
      Use of thermometer.
      Composition of air.
      Things that spoil pure air:
         Tobacco smoke, lamps, gas jets and ranges, people, dust, bad odors from unclean objects, such as clothing, bodies, teeth, decaying food.
      Effect of impure air on people.
      How to get pure air in the sleeping room, home, the schoolroom.
      How the air in the room moves; drafts.
      Amount of air needed.

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Problems—

Which is the best method of heating our homes?
Which system of heating gives the best ventilation?
What are some of the things that spoil pure air?
How is our schoolroom ventilated?
How is your home ventilated?
How may we get fresh air in our sleeping room?
How does the thermometer enable us to tell the temperature of our rooms?

3. Clothing; protecting the body.
   Different kinds of materials used, sources, method of making clothing from each; shoes and rubbers.

Problems—

What kind of material makes the best clothing?
Thru what changes does each kind pass from its source till it is made into clothing?
What points that effect health should be considered when buying shoes?

4. Avoiding infectious diseases.
   Causes, relation of bacteria to disease.
   Routes of transfer to well persons; food, water, flies, milk, contact (for nose and mouth discharge as in tuberculosis, thru sputum, mouth-spray and hands.)
   Prevention; clean hands, care in depositing spuctum, avoid throwing mouth-spray into people's faces, care of patients. (See placard issued by Minnesota State Dept. of Education.)

Problems—

What part do bacteria play in infectious diseases?
How may these bacteria be carried from sick to well persons? (See type lesson, page 165.)
What can we do to prevent our catching these diseases?
What can we do to prevent other people from catching diseases from us when we are sick?

5. The blood system; the errand boy of the body.
   Uses of blood, heart and blood vessels?

Problems—

What does the blood system do for the body?

6. What to do in case of accidents.
   Cuts, burns, drowning, suffocation, poisoning.

Problems—

What may be done in case of poisoning?
In case of apparent drowning how may respiration be restored?
In case of cuts what may be done to stop bleeding?
What may be done to care for burns?

III. Christmas Studies.
Christmas trees and other evergreens.

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Problems—

How can we identify the evergreens that grow around here?

What use is made of the wood of evergreen trees?

IV. Winter Sports.

Roller skating; going around curves, other illustrations of centrifugal force.

Problems—

How does roller skating differ from ice skating?

What other illustrations of centrifugal force can you think of?

V. Sky Studies.

The stars and planets; distances, size, relation to earth.

Observations on constellations, difference between winter and summer, constellations visible at all seasons, how to find the north star.

Problems—

How are stars different from planets?

Which has the greatest effect on man, the moon, sun, planets, or stars?

Which the least effect?

VI. Some Simple Machines that Make Man's Work Easier.

Pulley, screw, wedge. Common applications of each. Compare lever and pulley; inclined planes and wedge.

Problems—

How does each of these machines work so as to enable man to lift heavy loads?

How many applications of each can you think of?

VII. How Glass Helps People.

1. In reading—spectacles.
2. In seeing afar off—opera and field glasses.
3. In taking pictures—camera; blue prints; developing, printing.

Problems—

How do glasses help one to see better?

How do opera glasses seem to bring objects nearer?

In what ways is the camera like the human eye?

How can we make blue prints of leaves, or from some negative?

How many different kinds of cameras are there?

How are negatives developed?

What are the different ways of printing?

VIII. Helps in Being Prompt.

1. Watches and clocks.
2. School electric bells.
3. Old methods of telling time; sundial, hour glass.

Problems—

We will take an old alarm clock apart to see if we can understand how it keeps time.

How are our electric school bells arranged so as to give the signals for the periods?

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We will make an hour glass and see if we can keep account of time by it.

Spring

I. The Awakening Life of Spring.

1. Trees and shrubs.

A. Flower calendar of trees. Special study of tree flowers of common shade trees and fruit trees.

B. Special study of fruit trees and small fruits, such as apple, plum, cherry, strawberry, raspberry, blackberry, currant, pollination of fruit blossoms; grapes.

C. Watch development of twigs of fruit trees kept indoors in water.

D. Insect enemies of fruits—the codling moth.

E. Methods of propagating fruits.

Problems—

How do the flowers of our shade trees differ from the flowers of fruit trees?

In what ways is the apple blossom adapted to bring about insect pollination?

In what ways are the flowers of the plum and cherry alike?

How may we raise strawberries in our home gardens?

What are the methods of getting new apple trees?

What of getting new plants of grapes, currants and other fruits?

2. Cultivated shrubs.

Study of flowers of spring blooming shrubs such as lilac, Juneberry, golden bell, flowering almond, snowball, weigelia, bridal wreath.

Problems—

What makes each of these an attractive shrub to grow in our yards?

How can we tell them apart?

II. The Returning Life of Spring.

Birds.

A. Special study of birds of the slough such as red-winged blackbird, kingfisher, bobolink, marsh wren; and of birds of meadows and fields such as bobwhite, horned lark, goldfinch, meadow lark, song sparrow, vesper sparrow, field sparrow, flicker, cowbird, indigo bunting.

B. Building open nesting boxes for the robin and phœbe.

C. Migration; times; groups of birds (permanent, summer and winter residents, transient visitants); routes, distances, causes. Calendar of spring migration.

D. Bird enemies; bird protection. Special emphasis on the work of the Audubon Societies.

E. Formation of Audubon Bird Club; meetings during term.

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Problems—

What birds prefer to live near wet places?
Of what use are the birds of the meadows and fields to us?
Which is the most valuable of these birds?
What habits of these birds are specially interesting to us?
What kind of a nesting box can we make so as to get a pair of robins or phœbes to nest in it?
How are birds grouped according to the time that they stay with us?
Let us try to follow on a map the travels of a bobolink for a year.
What are the chief enemies of birds?
What is the Audubon Society doing to protect birds? (See type, lesson page 166.)
What can we in our Audubon club do to protect birds?
What are our state and national governments doing to protect birds?

III. Gardening. Main topic: vines and vine crops.

1. Schoolroom gardening.
   - A. Early in the spring plant indoors or in a hotbed a few seeds from the lists given below, so that the seedlings may later be transplanted to the home or school gardens.
   - B. Study of plant activities (to be answered by experiments.)
     - a. Effect of light on direction of growth of stem and leaves.
     - b. Effect of water on direction of growth of roots.
     - c. Effect of gravity on the direction of growth of stem and root.
     - d. How the squash seedling gets out of the seed coat.
     - e. Difference in the development of the seed leaves in the seedling of pumpkin and pea.

Problems—

How may we have early flowers and vegetables in our gardens?
What is the difference between a cold frame and hot bed?
What effect do light, water, and gravity have on the direction in which the parts of a plant grow?

2. School garden.
   - A. Plant seeds of some of the annual vines such as balloon vine, hyacinth, bean, canary bird flower, cypress vine, gourds Japanese hop, moon flower, climbing nasturtium, morning glory, sweet peas.
   - B. Plant some seeds of the vine crops such as melons, pumpkin, cucumber, winter and summer squash.
   - C. Plant summer flowering bulbs such as tuberose, gladiolus, dahlia.

3. Home gardens.
   - A. Distribute Cleveland order envelopes for penny packets of seeds.

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B. Encourage the children to plant some seeds from the lists given above under school gardens and also bulbs. Lessons on the culture of vines and vine crops. Value to body of the outdoor exercise in gardening.

Problems—

What are some of the best vines to plant?
How can these vines be raised?
In what ways is the care that the different vine crops require the same?
How may we raise some extra early cucumbers?
We will each make a plan on paper of our garden just as we would like to plant it.

4. Garden calendar; reports arranged in three columns as follows: Garden activity observed, date, name of child first reporting.

IV. Spring Sports.

Outdoor toys such as kite, windmill, water wheel—types, undershot, over shot, turbine; natural and artificial waterfalls.

Problems—

In what ways is an aeroplane like a kite?
Which are more useful windmills or water wheels?
How does a windmill differ from a waterwheel in the way it is made?
What is the best way to make toy water wheels and windmills?

Seasonal Order of Topics

March	April	May
Distribute seed envelopes.	Start tree flower calendar.	Indigo bunting.
Twigs of trees.	Red-winged blackbird.	Flowers of fruit trees.
Plant seeds indoors.	Flowers of shade trees.	Propagation of fruits.
Plant activities.	Lessons on home garden.	Bobolink.
Goldfinch.	Start garden calendar.	Marsh wren.
Bobwhite.	Song, vesper, field sparrows	Codling moth.
Spring sports.	Raising strawberries.	Cultivated shrubs.
Bird enemies.	Kingfisher, cowbird, flicker.	
Bird protection.	Bird migration.	
Form Audubon Club.		
Nesting boxes.		

SEVENTH GRADE

Central Thought for the Grade: The Hygiene and Science of the Home.

Fall

I. Making the Home Yard Attractive.

1. Shrubs; cultivated, and wild shrubs adapted for planting in the yard.
2. Vines; cultivated, and wild vines adapted for planting in the yard.

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3. Flower Garden.
   A. Perennials; identification of common kinds.
   B. Annuals; identification of new kinds not already known.
   C. Plant bulbs.

(In the fall study shrubs, vines and flowers for identification and to learn their decorative value.)

Problems—

How may our shrubs, vines and flowers be identified?
What decorative value has each of these for growing in the home yard?
Which make better garden flowers annuals or perennials?
What wild vines and shrubs are adapted for planting in the home yard?
Which are the best fall garden flowers?
What bulbs are best adapted to this climate?
How should they be planted?

II. Making the Yard Useful.
   1. The vegetable garden.
      A. Canning and storing vegetables.
      B. Garden insects.
      C. Garden weeds.
   2. The fruit garden.
      Canning fruits.

Problems—

What are the best methods of storing vegetables for the winter?
How may fruits be canned?
How does the method used in canning vegetables differ from that used for fruits?
What harm are insects doing to the garden?
What are the most troublesome weeds found in the garden?

III. Growing Plants Indoors.
   House plants.

Problems—

What plants are best adapted for growing in the house?
What care do these plants require?

IV. Insect Pests of the Household.
   Such as ants, cockroaches, carpet beetle, clothes moth.

Problems—

What harm does each of these pests do?
How may each be controlled?

V. Heating the Home.
   1. Fireplace.
   2. Stove.
   3. Hot air furnace.
   4. Steam.
   5. Hot water.

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6. Fuels used; chemistry of burning.
7. Causes and effects of heat.

VI. Ventilating the Home.

Means for each of the above methods of heating.

Problems—

What are the essential differences between the hot air, hot water, and steam systems of heating?

From the standpoint of heating alone which is the best system?

From the standpoint of ventilation which is the best system?

How can the advantages of the various systems from the standpoints of both heating and ventilation be combined in one system?

If the home is heated by stoves how may ventilation be secured?

In what ways is the burning of fuel in the furnace similar to the burning of food in our bodies?

What effects of heat are illustrated in these various methods of heating?

Seasonal Order of Topics

September	October	November
Flowers.	Canning fruits and vegetables.	Heating the home.
Shrubs.	Storing vegetables.	Ventilating the home.
Vines.	Insects.	
	House plants.	

Winter

I. Lighting the Home.

1. Kerosene; capillarity in wick.
2. Gas; relation of heat and light.
3. Electricity.
4. Protection from fire; fire extinguishers.

Problems—

What principles are involved in the working of the kerosene lamp?

What advantages has gas over kerosene?

What advantages has electricity over both gas and kerosene?

How do fire extinguishers work?

II. The Home Water Supply.

1. Springs; health considerations.
2. Wells; types—dug, driven, bored, drilled.
3. Cisterns; soft and hard water.
4. Pumps; air pressure, the siphon.
5. Hot water tanks.
6. Pneumatic water system; tank, pump, engine.
7. City water supply; source; pressure.
8. Ice; source, purity, methods of using; the ice chest; freezing ice cream.

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Problems—

What care should be taken to keep the water of wells and springs clean?
What are the differences between hard and soft water?
How is the lift pump constructed?
How may the country home have a supply of running water?
How is our city supplied with water?
What considerations of health should be taken into account in the use of ice?

III. The Food Supply.

1. Need of food.
2. Combinations of foods needed.
3. Economy of food selection.
4. Preservation and protection of foods.
5. Cooking foods.
   - A. Reasons for cooking.
   - B. Means of cooking; stove, gas, electricity, fireless cooker.
   - C. Chemistry of cooking.

     Experiments to show effects of heat on proteins, fats, and starches; tests for proteins, fats, and starches, and minerals; study of chief elements found in foods.—N. O. C. P. S. H.; tests for acids and bases; action of yeast and baking powder.

Problems—

Why does the body need foods?
How may one know what combinations of foods to select?
To what extent may economy be taken into account without injury to health?
What care should be taken to keep foods sweet and clean?
Which is the best means of cooking, by the stove, the gas range or electricity?
How is the fireless cooker constructed?

IV. Entertainment in the Home.

Musical instruments.

1. Phonograph.
2. Piano.
3. Violin, guitar, and other stringed instruments.
4. Causes of sound; physical cause of musical sounds.

Problems—

How is the phonograph constructed?
What are the principles involved in the making and using of records?
In the piano, violin, and other stringed instruments how is the pitch controlled? (See type lesson, page 166).
What makes the difference in the quality of the tones of these stringed instruments?

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V. The Electric Door-bell; construction, batteries.

Problem—

How does the electric bell work?

Spring

I. Making the Yard Attractive.

1. Shrubs and vines; selection of kinds; kinds to attract birds; arrangement; method of planting.

2. Flower garden; location; planning; selection of flowers for harmony of colors; physical explanation of color, the spectrum and rainbow; Preparation of soil; planting seeds; subsequent care.

A. Annuals; plant seeds.

B. Perennials. Plant seeds or set out roots.

C. Bulbs—study flowers.

(While in the fall the chief thought was the study of the plants themselves, in the spring the chief thought is the planting of the seeds and plants.)

Problems—

What shrubs and vines are best adapted to this climate?

How should shrubs be arranged to secure the most artistic effects?

What points should be taken into account in planning a flower garden?

What is the physical explanation of the difference in color of flowers?

How do annuals and perennials differ in the care needed to raise them?

What decorative value have the flowers of the bulbous plants?

II. Making the Yard Useful.

1. The vegetable garden. Financial returns; plan, selection of varieties, preparation of soils, tools, hotbed and coldframe, planting; care.

Problems—

What financial returns may be expected from a small vegetable or fruit garden?

What considerations that apply to the planting and care of the flower garden apply also to the vegetable garden?

To what extent is the consideration of varieties important?

What advantages has the wheel hoe?

How may early vegetables be raised?

What is the difference between the hotbed and coldframe?

2. The fruit garden. Classification of fruits, propagation, comparison with vegetable garden; dwarf fruits.

Strawberries; varieties, fall bearing, methods of planting, care the first, second and third seasons; financial returns.

Grapes; raspberries and other bush fruits.

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Problems—

Which is the best method of setting out strawberries?

How may strawberries be obtained in the fall of the same year the plants are set out?

How does the care of the strawberry for the first season differ from the care the second and third seasons?

How does the method of raising raspberries differ from the method of raising strawberries?

How do fruit growers get new plants of strawberries, raspberries and currants?

How may grapes be raised in Minnesota?

How do dwarf fruits differ from the ordinary kinds?

3. Poultry keeping.

Financial returns; varieties, housing, feeding, hatching eggs, rearing chicks.

Problems—

What are the interesting things about poultry keeping?

What conditions must a good house meet?

How should poultry be fed?

Which is the better method of hatching eggs by incubator or hen?

4. Bee keeping.

Financial returns; kinds of bees, life of the hive, swarming, wintering.

Problems—

What advantage does bee keeping have over poultry keeping?

What disadvantages?

What care should be given bees during the swarming season?

How should bees be wintered in this climate?

Which offers better opportunities for financial returns, bee keeping or poultry keeping?

III. Enemies of the Garden.

Insects, such as cut worm, cucumber beetle, potato beetle, squash bug, corn ear worm, white grub.

Problems—

What harm is done by each of these insects?

What is the remedy for each?

IV. Friends of the Garden.

1. Birds.

A. Birds of the garden and orchard, such as chickadee, cuckoo, kingbird, nuthatch, phœbe, wood thrush, woodpeckers, grosbeak, robin, wren, bluebird, Baltimore oriole.

B. Attracting bird friends to the yard and garden by providing nesting boxes, fountains, and planting shrubs to furnish fruit.

C. Bird songs; how made (syrinx), time of day and season given, differences, reproduction on musical scale.

D. Plumage of birds; molting, differences in color according to age, sex, and season.

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Problems—

Why is it desirable to have birds around the yard and garden?
How may each of these birds be identified?
Which is the most interesting bird?
In what ways is the wren (or any other bird) useful?
What may be done to increase the number of birds around our homes?
Which birds have the most musical songs?
How can we identify birds from their songs?
Thru what changes in plumage does a rose-breasted grosbeck pass from the time it is first hatched till it is two years old?

2. The toad.

Problems—

Of what use is the toad in the garden?
What may be done to increase the number in our gardens?

3. Insects; such as lady beetle, ground beetle, aphis lion, dragon fly, ichneumon fly, bees, tiger beetle.

Problems—

In what ways is each of these insects beneficial?
Which do you consider the most helpful?

V. Soils of the Garden.

Kinds, composition, origin, water capacity, capillarity, fertilizing, cultivation.

Problems (to be answered by experiments)

What is the value of cultivating the garden besides killing the weeds?
How do roots get water from the soil in a dry season?
What kind of soil is best for furnishing water to plants during a dry spell?
What kind of soil holds the most water after a rain?
Which is better for raising early vegetables, a sandy or clayey soil?
What effect does drainage of a wet soil have on the growth of plants?
Of what is soil composed?
How may the test for acid soil be made?

Seasonal Order of Topics

March	April	May
Soils.	Shrubs and vines.	Bee keeping.
Poultry keeping.	Shrubs for birds.	Enemies of the garden.
Nesting houses for birds.	Fruit garden.	Friends of the garden.
Plumage of birds.	Vegetable garden.	Bird songs.
	Flower garden.	Flowers from bulbs.
		Bird fountains.

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Eighth Grade

Central Thought for the Grade: the Sanitation and Science of Community Life

Fall

I. Insects That Threaten Health.
  Fly and mosquito.
  Problems—
    What harm is done by each of these insects?
    What are the remedies to be used in each case?
    Which is the more dangerous insect in Mankato?
    Thru what changes does each pass in its development?

II. Insects in Relation to Growing Crops.
  1. Insect foes.
    A. Insect enemies of the vegetable garden.
    B. Insect enemies of the orchard.
    C. Insect enemies of cereal crops.
    D. Insect enemies of shade trees.
    E. Means of control; poisons used, their solubility.
  Problems—
    What harm is done by each of these groups of insects?
    What are the remedies?
    How do the various remedies used differ in their method of operation?
  2. Insect friends.
  1. Those that destroy injurious insects.
    A. Parasitic insects.
    B. Predaceous insects.
  2. Insects that pollinate flowers.
  Problems—
    In what ways is each group of insects beneficial?
    How do parasitic insects differ from predaceous in their method of destroying insects?
    Which is greater the good or harm that insects do?

III. Plant Enemies of Crops.
  1. Weeds; of vacant lots, of roadsides, of crops; harm done, identification, control, state laws.
  2. Fungous diseases.
  Problems—
    In what ways are weeds harmful?
    What are the most common weeds found growing by roadsides and in vacant lots?
    How may each of these weeds be identified?
    What characteristics do weeds possess that make them so troublesome?
    What adaptations do weeds have for the dispersal of their seeds?
    How many seeds may a single plant produce?
    What are the best means to use to control weeds?
    In what ways may fungi injure plants?

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IV. Forest trees.

Study of trees found around Mankato which may grow elsewhere in forests.

Problems—

How may the different species of trees in the following groups be identified: oaks, ashes, maples, elms, evergreens?

How are the fruits of trees adapted for seed dispersal?

What references are found to trees in literature?

V. Means of Travel.

1. On land.
   - A. Steam cars—the steam engine.
   - B. Street cars—the motor.
   - C. Automobile—the gasoline engine.
   - D. The motor cycle.

Problems—

How does the steam engine work?

How does the gasoline engine differ from the steam engine?

How is the motor constructed?

Which is the more useful, the steam engine, the motor, or the gasoline engine?

2. On water.

Steamboats, sail-boats, submarines; Archimedes principle. The compass, the gyroscope.

Problems—

How is the modern steamboat constructed?

How does one manage a small sail-boat?

Why is the gyroscope sometimes used on ships instead of the compass?

We will perform some simple experiments to learn why a canoe or boat floats when it is loaded.

3. In air.
   - A. Aeroplanes; use of barometer to tell height.
   - B. Balloons—common and dirigible.

Problems—

What are the differences between the aeroplane and the dirigible balloon?

Which offers the greater possibilities of usefulness?

How can the air man tell how high he is?

In what way is a balloon in the air like a boat on water?

VI. Means of Communication.

1. The telephone.
2. The telegraph—both common and wireless.

Problems—

How are the telephone and telegraph constructed?

Which is the more useful?

How does the wireless differ from the ordinary telegraph?

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Seasonal Order of Topics

September	October	November.
Fly and mosquito.	Weeds.	Means of travel.
Insect foes of crops.	Forest trees.	Means of communication
Insect friends of crops.		

Winter

I. Public Health and Sanitation.
   1. Board of health—its duties and ordinances.
   2. Milk supply—inspection needed.
   3. Protection of food supply.
   4. City water supply; water pressure.
   5. Control of fly nuisance.
   6. Treatment of contagious diseases; quarantine, vaccination.
   7. Sewage disposal and removal of garbage; oxidation.
   8. Parks and playgrounds.
   9. Fire protection; fire engines.
   10. Care of streets.
   11. Lighting the streets—the dynamo.

   Problems—
   What are the duties of the Board of Health of Mankato?
   What ordinances have they had passed to protect our health?
   What can each of us do to help the Board of Health in its work to protect the public health?
   What inspection is given our milk supply?
   What is done to keep our meats, bread, pastry, fruits, and vegetables clean?
   What is done to guard our water supply?
   What was the cause of the typhoid epidemic in Mankato a few years ago?
   What is done when a case of contagious disease is found?
   How are the sewage and garbage disposed of?
   How does Mankato compare with other cities in its parks and playgrounds?
   How are we protected from fires?
   How are fire engines constructed?
   What care is given our streets?
   What are the chief things that still need to be done in Mankato to further protect our health?

II. School Hygiene.
   1. Ventilating and heating.
   2. Lighting.
   3. Drinking fountains.
   4. Playgrounds.
   5. Medical inspection.

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Problems—

How is our building heated and ventilated?
Why should the public drinking cup be abolished?
What is being done in other cities in the medical inspection of schools
What is being done in Mankato?
What further could be done along this line?

Spring

I. Forestry: with special reference to the forests of Minnesota.
   1. Uses of forests.
   2. Decrease of forests.
   3. Enemies of forests.
   4. Proper methods of handling our forests.
   5. Need and method of saving our forests.
   6. State and national reservations.
   7. The Bureau of Forestry of the Department of Agriculture.
   8. Work of the Minnesota State Forest Service.
   9. Tree planting on prairies.
   10. Work of the parts of a tree—root, stem, leaf.
   11. Structure and uses of wood.

   Problems—

   Of what use are forests while standing?
   What are the chief enemies of forests? (See type lesson, page 167)
   How may these enemies be controlled?
   What is the proper way to care for forests?
   What national reservations has the government made?
   What is being done by the national Bureau of Forestry to care for our national forests?
   What is being done by the Forest Service of Minnesota to care for our state forests?
   To what extent may trees be planted on the prairies?
   What work is done by the roots, stem, and leaves of the tree?
   How does the appearance of the cuts of different woods differ?
   How does the appearance of different cuts of the same wood differ?

II. Bird Friends of Our Trees and Forests.
   1. Special study of the birds of the woods, such as warblers, thrushes, woodpeckers, vireos.
   2. Economic value of birds to the forests in destroying injurious insects; value elsewhere in destroying also weed seeds and rodents.
   3. Bird enemies; shooting, millinery, cats, English sparrow, natural enemies.
   4. Work of national government to protect birds.
      A. Laws protecting migratory birds.
      B. Tariff restrictions on feathers.
      C. Bird reservations.
      D. Work of Bureau of Biological Survey.
   5. Adaptations shown in bill, feet, tail, and wing.

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Problems—

In what ways are birds useful to the forest?
In what other ways are birds useful?
How may we identify the different species of the following bird families: warblers, vireos, woodpeckers, thrushes?
What interesting habits of these birds may we study this spring?
Which have done more harm to the birds man or the birds' natural enemies?
What is the national government doing to protect birds?
How can we help in this work of protecting the birds?
How do water birds differ from land birds in the structure and use of their feet, bill, wings, and tail?

Seasonal Order of Topics

March	April	May
Forestry.	Forestry.	Birds.
	Birds.	

SERIES OF TYPE LESSONS

THE NASTURTIUM

First Grade—Fall

Child's Problem—

How can we tell the nasturtium from other flowers the next time we see it?

Outline of Development—

1. Color of flowers.
2. Shape of flowers.
3. Size of flowers.
4. Place where flower grows.

Application—

Ask each child to bring a nasturtium to school to help make a bouquet for the schoolroom.

Materials—

A nasturtium flower for each child.

Correlated Work—

Have children draw colored pictures of the flower in mass, using colored crayons.

THE DOG

Second Grade—Winter

Child's Problem—

How can I take the best care of my dog?

Outline of Development—

1. Food.
2. Drink.
3. Shelter.
4. Kindness.

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Application—

Ask those children who have dogs to notice one of these points at a time, and see if they are giving their dog the best care they can.

Materials—

Pictures of dogs and their kennels.

Correlated Work—

Children make free hand cuttings of dogs; construct kennel from paper. A story about dogs may be read to children.

NESTING HOUSE FOR WREN

Third Grade—Spring

Child's Problem—

What kind of a house shall we build for a pair of wrens to nest in?

Outline of Development—

1. Kind of materials to use.
2. Size of house.
3. Shape of house.
4. The entrance hole.
   - A. Size.
   - B. Shape.
   - C. Location.
5. Provision for fastening.

Application—

Ask the children to make bird houses at home.

If any children have difficulty in getting the houses made at home, ask them to bring materials to school so that the teacher may help them.

After the houses are all finished ask the children all to bring their houses to school so that a picture may be taken.

(This lesson is to be followed by another after the houses are finished, on how to put up the house, involving a consideration of the place to put it, the method of fastening, and the protection to give it.)

Materials—

Several kinds of wren houses; if possible one with a wren's nest in it; picture of wren; pictures of wren houses.

Correlated Work—

This work may be done in coöperation with the manual training department.

BULBS FOR INDOOR BLOOMING

Fourth Grade—Fall

Child's Problem—

How can we have some daffodil flowers in our room next winter?

Outline of Development—

1. Outfit needed.
   - A. Flower pot.
   - B. Soil.
   - C. Bulb.

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2. Method of planting bulbs.
   A. Cover drainage hole.
   B. Fill with soil.
   C. Depth to cover bulb.
   D. Watering.
3. Place to keep flower pot.
   A. Dark.
   B. Cool.
   C. What happens here.
   D. Time to keep here.
4. Later care in schoolroom.

Application—

Let the children do the work of planting the bulb, and encourage them to plant bulbs at home. Suggest that if they want to give a new kind of Christmas present, they can start the Chinese lily bulb about the middle of November and it will begin to bloom about Christmas, and may then be given as a present.

Materials—

Flower pots, soil, bulbs of daffodil; pictures of daffodil flower.

THE MOON

Fifth Grade—Winter

Child's Problem—

In what ways is the moon different from the sun?

Outline of Development—

1. Size.
2. Temperature.
3. Relation to earth.
4. Motions.
5. Times of rising and setting.
6. Position in sky.
7. Portion visible.

Application—

Have children make close observations on the changes in time of the rising and setting of the moon and sun and note differences.

Materials—

Diagram on board or chart showing relative position and distances of sun and moon with reference to earth; circles showing relative sizes of sun and moon. Pictures of the surface of the sun and moon.

TUBERCULOSIS

Sixth Grade—Winter

Child's Problem—

In what ways are tuberculosis germs carried from sick to well persons?

Outline of Development—

1 Flies.
2. Milk.

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3. Contact.
   A. Sputum; brought into house on shoes.
   B. Mouth spray; singing, coughing, shouting, sneezing.
   C. Hands; handkerchief, towel.

Application—

Ask the children to watch closely for a few days the people they meet and see if they do anything that might enable the germs to be carried in any of the ways mentioned above, supposing that these people had tuberculosis.

(This lesson should be preceded by lessons on the nature and extent of the disease; and followed by lessons on how to prevent the spread of tuberculosis.)

Materials—

Pictures of tuberculosis germs; pictures illustrating any of the above means of carrying germs.

AUDUBON SOCIETY

Sixth Grade—Spring

Child's Problem—

What is the Audubon Society doing to protect birds?

Outline of Development—

1. Legislation.
2. Wardens.
3. Lecturers.
4. Bird reservations.
5. Publications.
   A. Bird Lore.
   B. Leaflets.
6. Junior Audubon Societies.

Application—

Have the children form a Junior Audubon Society to help protect birds.

Materials—

Samples of the leaflets and pictures published by the Audubon Society. A November–December issue of *Bird-Lore*, which always contains the annual report of the Society, and has pictures illustrating their work.

PIANO AND VIOLIN

Seventh Grade—Winter

Child's Problem—

In the making and tuning the piano and violin how are the different notes made to vary in pitch?

Outline of Development—

1. Length of strings.
2. Size of strings.
3. Materials of which strings are made.
4. Tension on strings.

(These points should be developed by means of simple experiments.)

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Application—

Have the children observe at home and elsewhere a number of stringed instruments, piano, violin, guitar, banjo, mandolin, and determine which of the above means are used in each instrument.

Materials—

A variety of strings used on string instruments, wires of different diameters, and different materials, ordinary strings of various sizes; a box from 2 to 3 feet long across which the strings and wires may be stretched; bricks or other weights which may be attached to the strings to vary the tension.

ENEMIES OF FORESTS

Eighth Grade—Spring

Child's Problem—

What are the chief enemies of forests?

Outline of Development—

1. Fires.
2. Reckless lumbering.
3. Grazing.
4. Insects and fungi.
5. Wind.

Application—

Ask the children to watch the papers for references to destruction of forests especially by fires, to cut out the clippings and bring them to school, where they may be kept on a bulletin board.

Materials—

Pictures illustrating forest destruction by the agencies named above; specimens of insects and fungi found on trees.

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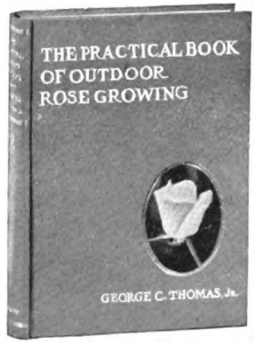

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The Robin

My old Welsh neighbor over the way
Crept slowly out in the sun of spring,
Pushed from her ears the locks of grey,
And listened to the robins sing.

Her grandson, playing at marbles, stopped,
And, cruel in sport as boys will be,
Tossed a stone at the bird, who hopped
From bough to bough in the apple-tree.

"Nay!" said the grandmother, "have you not heard,
My poor, bad boy! of the fiery pit,
And how drop by drop, this merciful bird
Carries the water that quenches it?

"He brings cool dew in his little bill,
And lets it fall on the souls of sin:
You can see the mark on his red breast still
Of fires that scorch as he drops it in.

"My poor Bron rhuddyn! my breast-burned bird!
Singing so sweetly from limb to limb,
Very dear to the heart of our Lord
Is he who pities the lost like Him!"

"Amen!" I said to the beautiful myth;
"Sing bird of God, in my heart as well:
Each good thought is a drop wherewith
To cool and lessen the fires of hell.

"Prayers of love like raindrops fall,
Tears of pity are cooling dew,
And dear to the heart of our Lord are all
Who suffer like Him in the good they do!"

Whittier.

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The Nesting of the Black Tern

(*Hydrochelidon nigra surinamensis*)

CHARLES KNAPP CARPENTER

Naturalist, Elgin, Ill.

(With photographs by the author)

The black tern is found to be fairly common in northern Illinois if one searches in suitable localities.

It is a marsh bird and yet many marshes may be investigated without finding this species. In other marshes, however, it may be found in considerable numbers.

Its irregular distribution leads some people more or less familiar with birds to assert that it is only a bird of the ocean or of the Great Lakes. A number of years ago, the author was delivering a series of bird lectures at the Dixon (Illinois) Chautauqua and made some reference to this bird being a native. During the dinner hour, a gentleman at the hotel which stood on the bank of Rock River was telling a group of men about the blunder made by the lecturer, who when he entered the dining-room was taken to task and was told that these birds were never to be found in the interior of Illinois. Chancing to look out of the window overlooking the river, he noticed a flock of them skimming the water and "hawking" for insects. They were probably working south from some marsh, and following the river. Calling the group to the window he said, "Gentlemen, there they are." But they are easily overlooked because of their being so restricted in their habitat.

The black tern is sometimes called the short-tailed tern to distinguish it from its tern-cousins. Others compare it to a swallow because of its manner of flight and long wings, and would call it the Marsh Swallow.

The tern is not quite ten inches long while the wing is over eight inches in length. During the early breeding season, the head, neck and lower parts are a sooty-black while the other principal color is a silvery-grey or plumbeous. But during the nesting season the moulting is taking place and the black feathers are changing to white so that a person might think there were two or three different species.

The bird does not spend much time building the nest. Some of the nests are built directly on the water where the growing grass helps to support them; but usually a pile of floating vegetation

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or an old muskrat house furnishes the foundation. On this the bird arranges a shallow "saucer" of grass, and deposits the three

Upper—The Black Tern incubating.
Lower—Nest of Tern on old muskrat house.

eggs. The eggs vary in color considerably, from greenish to quite dark brown and are "thickly spotted and blotched lilac and darker brown." The dark markings are often gathered

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about the larger end. The eggs are about one and a third inches in length, and an inch in thickness.

The particular nest of which I write was built on an old muskrat house in a dense bed of cat-tails, but surrounded by several feet of fairly open water where the muskrats had cleared the vegetation away, the preceding year. The bird had carried enough grass to make the lining of the nest on the coarse foundation afforded by the muskrat house. The nest was found June 7th but the eggs were probably laid the last of May.

June 23d, incubation was about completed. One egg had not yet hatched, but there were two little birds in the nest that could not have been over a day or two old.

Fortunately the muskrat house being surrounded by fairly open water, the little chicks could not run away and hide as they usually do and I had several days in which to study them. I find myself calling them "little chicks" for they looked so much like little buff cochin chickens, brown with irregular markings of black. The interior of the mouth was light red, the feet pink grey. The birds did not like to stay in the nest. A solitary bunch of cat-tails grew through the center of the old house, and the older of the little birds spent much of its time in the shadow of this, as the pictures will show.

They were frequently at the water's edge, seemed to enjoy standing in it, and would frequently drink.

The old birds were not yet mottled from moulting and as they are colored alike, I could not distinguish between the father and mother. One bird may have done all the work.

On June 23d, this was the interesting problem confronting the old bird. One egg yet remained to be hatched, while two little chicks were old enough to require food. I was concealed nearby for several hours and saw how successfully the old bird solved the problem. It would incubate for several minutes, then dart away, only being gone a few seconds and come back with food for one or the other of the babes, then return to the nest.

The food was nearly always a small dragon-fly with which the large marsh abounded. The parent did not place the food in the babe's throat as the song-birds do but handed it to the babe which would seize the food as readily as a little chicken does. Sometimes the old bird would not alight, but hovering for a moment with outstretched wings and feet hanging down, would hand the food to the babe and dart away for more.

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My next visit to the nest was June 25th. The third egg had hatched and the little chick could not be distinguished from the others in spite of the difference in age. Though there was no

Upper—Baby in shadow of cat-tails.
Lower—Two baby birds. One egg unhatched.

incubating to be done, the bird was back at the nest much of the time, sometimes resting on the nest, but usually walking about and seeming to look at the babes with great admiration. They persisted in playing in the edge of the water much of the time.

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Most of the food consisted of dragon-flies. One time the old bird brought back a huge morsel of food. It was our largest common dragon-fly, just before leaving the shell. It had evidently crawled up on a rush to split open the shell and escape into the air when captured by the tern. But it seemed incredible that it could be fed. It actually seemed larger than the outside circumference of the little bird's throat. It was about two and a half inches long and a half inch in diameter.

It was passed over to one of the chicks and then began a tug-of-war. The chick choked and tugged and a couple of times seemed to repent of its job, and tried to cough the dragon-fly up, but kept at it and won out. I do not see how it found room for it. For several minutes the head of the little bird was stretched out and throat distended as though the larva like a stick stretched from throat to bottom of stomach as the picture shows (page 178). The digestive juices must be extremely powerful, for in a few minutes the discomfort was over and the bird was normal.

The marsh abounded with garter-snakes which found the tadpoles easy prey, but they bothered the birds a good many times. The birds, however, were equal to the occasion and always routed the intruders as I saw several times. One time, the snake was unusually large for this species. It crawled up out of the water onto the farther side of the muskrat house. I feel sure that it smelled the nest or birds for it moved its head about in different directions as though locating the direction and gradually crawled nearer to the nest. At last it crawled over the crest of the house and there was "the promised land," but not just as the snake wanted it, for the parent bird was there, and that meant war. So it crouched down among the dead vegetation, well concealed to wait for the old bird to go when it might seize the babies. The old bird did not see it. I waited breathlessly though I did not intend that my little friends should be killed by that ugly snake. I would go to the rescue if necessary. The old bird raised its wings to dart away in pursuit of food when it caught sight of that crouching snake. It attacked it furiously with beak and claws and wings and drove it pell-mell into the water. Then the old bird dropped down on the nest and gave some pathetic clucks as the old hen does to her chicks, and the little birds went tumbling as fast as they could to get hidden away under the old bird.

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My next visit to the nest was June 28th. The three little birds were still on the muskrat house undoubtedly because of the difficulty of getting across the open water surrounding it. They did not seem any larger, and the family duties went on as already described. July 1st, the little birds were not to be found. I have

Upper—Old bird passing food to baby bird.
Lower—Baby bird playing in water.

no doubt they had swum across to the rank growth of reeds and rushes and were safely hidden.

However, the old birds protested against my invasion of the marsh as vigorously as ever. Here is an interesting habit of this bird shared only by the marsh hawk among the marsh birds.

Whenever I went to the marsh, the terns would meet me when I was 12 to 15 rods away, flying about my head and screaming,

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"krik, krik, krik." The men of the farm would tramp along the edge of the marsh making hay, and the birds would pay no attention to them, but they knew me after the first visit as the one who invaded their premises, and though no harm was done they would

Upper—Bird feeding without alighting on ground.
Lower—Old bird with larval dragon-fly.

persist in voicing a vigorous protest. They seem to have no fear. One day I was standing up to my waist in water, taking some pictures of baby pied-billed grebes. I was using my large straw hat to keep one of the little birds within reach. As I was trying to get the camera adjusted, a dozen terns made life miserable for me.

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They would fly around in short circles, swoop down and just before getting to me, drop their legs straight down and hit my head a stiff blow. Though there is plenty of hair on my head, the blow hurt. Yet as I tried to scare them away and they would not leave, I had to laugh because of their impudence. I tried to

Upper—The old bird dropped on the nest.
Lower—Hidden away under the old bird.

grab them as they would swoop, but they would shoot up quickly enough to elude me.

Observations of two other nests lead me to believe that the old birds share the family duties about equally. One instance relates to the matter of incubation. I was about three rods from the

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nest, but having a perfect view of it, while I was making notes and taking a series of the least bittern. During the hours there on several different days, I kept track of the tern's nest and found that the two old birds took turns regularly, incubating the eggs. The surprising thing was the shortness of the shifts. They changed positions about every 15 minutes. This may not be normal. This was the second set of eggs the last week in June and the birds may have been restless. These eggs hatched the 13th day of July. Study of another nest showed both birds sharing the work of caring for the young. This nest hatched July 3d. The nest

One on the nest while the other rested nearby.

contained but two eggs. I found a floating egg about 15 feet away and put it in the nest. Immediately, the birds made a great outcry. Both were on the nest or by the nest almost all of the time. The bird incubating would roll this foreign egg out of the nest, then roll it back under its breast, but there was something about the egg that was not right. It may have had the smell of an enemy about it, or it may have been spoiled or more likely the egg from another nest. Anyhow, the bird would cover it for a few seconds, then scream and thrust it out. Finally one of the birds shoved its beak into the egg and flew away with it. These

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little birds only staid in the nest two days, then got away into the surrounding vegetation. The old birds did not feed them at all, seemingly. They were living upon the nourishment received from the egg.

But the old birds sheltered them most of the time. One of the old birds had moulted considerably and had large patches of white on it as the picture will show, so that it was easy to distinguish them. One would be on the nest while the other stood or rested nearby, then they would change positions.

The last of July I made the final visit to the marsh. The black terns had become almost white terns, but they had not lost their sauciness. Watching them circling about my head, and screaming defiance at me, I waved them a good-bye until another year should pass.

Feed the Birds in Winter

SUSAN B. SIPE

The number and variety of birds that one may bring around a suburban home is surprising, if food is provided regularly for them in winter. I have had forty-five kinds in one year in a yard that has few trees and no dense shrubbery and that covers but 3,500 square feet. By feeding them in winter, one is loath to lose them as the spring comes on and migration is under way and so continues to feed them with the resulting pleasure of having the veery, the hermit thrush, the red-bellied woodpecker, the fox sparrow, stop for a short season on their way north. There must be a language of the air, as there is among the followers of the road, that directs these travellers to food and water or how could they otherwise find such a tiny bird bath or feeding shelf?

Suet is a favorite food. It should be tied securely to the trees for the blue-jays and grackles will carry off quite large pieces. A loosely crocheted covering will prevent them. Be sure to fasten the suet near a twig to provide a perch for the birds. They stay longer if it is comfortable at the meal.

Birds are especially fond of peanuts. I string them on a long linen thread, passing the needle through the nut twice to prevent it slipping and then attach the string of nuts tightly around the tree. In a very short time the nuthatches come and with their very long bills peck a hole at one end and extract the nuts. Dur-

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ing a heavy snowstorm last winter, I took a string of empty shells into a kindergarten class and told the little ones about the way the nuthatches hammered holes in the peanuts. One child discovered a nut which had escaped the sharp eyes of the birds. Its glee was as great as though it had discovered a treasure island. Later, at the suggestion of one of the children, the little ones strung a quart of nuts and sent them to the "country birds" to eat in wintry weather.

Sometimes I mix shelled peanuts with bread crumbs and suet and place them on the bird shelf that I have fastened to one of the trees. This shelf is a two foot board with a strip an inch and a half wide nailed around it to prevent the food being scattered by the birds or the wind. It is fastened to the tree by means of a small iron bracket.

The children of the neighborhood call it the "birds' hotel." Beside bread and nuts, birds are very fond of small grain. Sometimes I give them wheat. Sometimes the regular chicken feed is used. When the snow is heavy I sweep a path from the house to the bird shelf and sprinkle grain quite generously, particularly in foot-prints. I have counted a hundred little birds at one time—juncos, tree sparrows, song sparrows, purple finches with a scattering of blue birds, cardinals, blue-jays and tufted tits. For variety I occasionally put out apple, cocoanut, raisins or hard boiled egg but generally the bill of fare consists of suet, bread, peanuts and grain. I collected sumac berries last fall and scattered them over the snow. As far as my observation extended none but the blue birds ate them.

Water is most important for the birds. One must learn by experience. My bathing and drinking tank is a shallow, cement one, a foot wide and two feet long, at the foot of the tree that holds the bird shelf. It has served its purpose until recently when a number of stray dogs and cats have discovered it with the result that the birds fear to come near and there is seldom water in it no matter how often it is filled. It will be replaced by an elevated one.

It is interesting to watch the small birds waiting for the robins, the grackles and jays to finish their baths before they attempt to go in. I have seen a dozen birds waiting their opportunity. The grackles use it to soak their bread in. Over and over again I have seen them pick up a piece of bread, walk deliberately to

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the water, dip in their bread and then eat. It is always necessary to put in fresh water after they have had a meal.

A brush pile is an addition as it gives a shelter from cold and cats. With shelter, food and water and a fondness for birds that will not allow irregular feeding, I can promise much pleasure on wintry days.

Recording Bird Music

HENRY OLDYS

While in recent years there has been a wide-spread awakening of interest in birds, such as the world has never known hitherto, yet the attention of very few of the new army of observers has been directed toward the study of bird music. This is largely due, of course, to the lack of that special musical training which is necessary for the pursuit; but duly allowing for this we yet shall find a large number who are well qualified to pursue such investigations but who, for various reasons, have never applied their faculties to this particular subject. To such persons, to every one who has sufficient musical knowledge and a good enough ear to enable him to write down on the staff any simple melody that he hears, I would heartily recommend the pursuit as one that offers a fascinating and unfailing source of pleasure for those moments not required by the sterner duties of life.

One of its chief charms is that the student becomes at once an explorer of virgin fields, and of fields that are inexhaustible. The variety of bird songs is practically infinite. Geographical and individual differences so multiply diversities that the recorder of bird music is quickly impressed with the feeling that however assiduously and diligently he employs his time he will be able to cover merely a minute area of the boundless region that stretches before him. Were we even to specialize to the point of noting only the utterances of wood thrushes he would yet have laid out for himself a larger territory than he could cover within the narrow limits of a lifetime. When we consider that there are millions upon millions of wood thrushes, that most of these differ from each other in the phrases they utter, and that each has a more or less extended repertoire of phrases which he combines in various forms, it may be readily understood that there is no visible end to the recording of wood-thrush music. I have myself noted more than eighty different wood-thrush phrases in the course of my general study of bird

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songs. Only a very few of these, as, for example, the two shown in notation No. 1, were the common property of different birds; and as these common phrases were always used in different combinations by their different possessors it may be safely asserted that no two wood thrushes have identical songs. Here, then, is offered by this one species enough of melody to yield one transcriber occupation for life. I do not advise such specialization. It is too much like that of the German professor of classical languages who said to his family gathered about his deathbed:

"Children, I have devoted all my life to the study of the Greek noun Χρῶμα and I feel that I have wasted my time:—I should have confined my attention to the dative case."

I do not believe the story (though I have seen a German-made microscopic slide which, under the powerful magnifier, showed a perfectly reproduced and properly colored bouquet of flowers manufactured of the differently colored scales of butterflies!) but it serves a good illustrative purpose. Neither do I recommend making the collecting of bird songs the principal business of life, for the same reason, the undue narrowing of the field of mental energy. It should be undertaken as a recreation, a hobby, a pursuit for leisure moments, an incentive for exercise in the open. Followed in this way it becomes a healthful and extremely enjoyable avocation, an interesting adjunct to the life pursuit, whatever this may be.

Song sparrow phrases are even more diverse than those of wood thrushes. A single song sparrow may have a dozen or more in his repertoire; and as song sparrows outnumber wood thrushes easily ten to one and one rarely hears the same phrase sung by any two song sparrows, it would require fifteen or twenty nimble transcribers of song sparrow music to keep pace with one wood thrush reporter. Many song sparrow songs are, however, not transcribable; for this cheery little musician of the fields has taken a leaf out of the book of some of the modern French and Russian composers and produces music that violates all known rules of melody and harmony. Nay, he out-Herods Herod and often makes use of intervals other than those that go to make up our diatonic and chromatic scales (though it must be said that judging from the rapid progress of his human competitors he will not out-Herod Herod long). But song sparrows are very diverse in their musical accomplishments and many there are of saner character than

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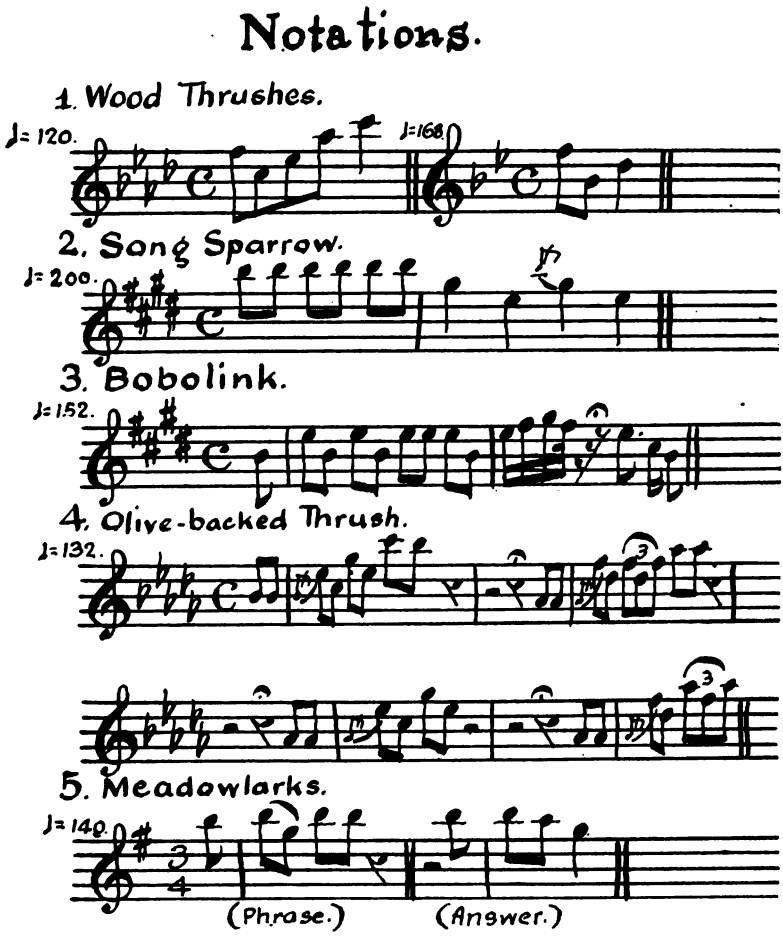
their decadent brethren who are able to express the melody that is in them without passing beyond the confines of the natural sphere of music. Here and there the reporter of bird music will meet with a song sparrow phrase that is pure melody, as determined by the

unwritten laws of universal taste. Such a song, for example, as I heard day after day from my desk in the Department of Agriculture, uttered by a song sparrow from its favorite perch, a telegraph wire outside my open window (see notation 2). Many a bit of melody of this nature may the listener secure and record.

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Individual variety of song is not due only to the utterance of different phrases. As with human musicians, birds of the same kind, particularly among the better singers, will display different degrees of excellence between mediocrity and mastership. Bird fanciers will not need to have this fact pointed out, especially as regards canaries, though they may not realize to how great an extent the rule holds as to wild birds. I have heard wood thrushes whose songs were very unattractive, consisting of unmelodious themes, out of tune and delivered in tones that lacked beauty. And again, I have heard others whose performances were so superior that the woodland spot that formed the setting for their music became a shrine worthy of pilgrimages on the part of musicians.

But it is not alone the muscial side of one's nature that is stirred by observation and recording of bird songs. Analysis of the material secured yields results that delight the soul of the philosopher. For when the student discovers, as he will very soon, that this music, emanating from a different class of beings than ourselves and developing along a separate evolutionary channel, shows goverance by constructive rules that govern our own music, there opens before his gaze a line of research of intense interest and of great value in throwing light upon philosophical problems more or less shrouded in gloom. Philosophers like Spencer, Weissmann, Wallaschek, Fétis, Helmholtz, and Sully have wrestled with questions concerning the nature of music, its origin, and evolution, the nature and origin of the æsthetic sense, and similar problems. The study of bird music clears away many of the difficulties of these questions and brings some degree of order to the chaos of diverse opinion. Thus, to select one example out of many, Herbert Spencer concludes that music found its origin in human speech. But this hypothesis falls to the ground the moment we find ourselves compelled to assume a common origin for the music of man and bird.

The analyst of bird music will find himself confronted with numerous questions that will pique his interest and stir his ambition. Why should the song sparrow whose song I have mentioned be dominated so strongly by a sense of regular rhythm? Why should he have developed a sense of tonality that causes him to observe a definite key throughout his song and close with the keynote? Why should a bobolink I heard at Monroe, Wis., last June, sing a

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well-balanced song of three divisions (see notation 3)? And why did the singer always repeat this arrangement of notes without change? Why does the four-phrase twilight song of the wood-pewee often follow the same form of construction that marks many of our own four-line hymns and ballads? How came it that an olive-backed thrush I listened to on Mackinac Island one summer day a year or two ago based his song of four phrases (sung invarably in the same order) on a pleasing alternation of dominant and tonic harmony (see notation 4)? Why do meadowlarks, and to a certain extent other birds, sing duets in which phrase and response are musically related (see notation 5)? These and many similar questions will present themselves to the mind of the student and impose on him a pressing duty to give to the world the results of his research. And here let me say that the same gratifying vista opens out before the student in any line of research. Many, especially the young, have an impression that the investigations of the past have so exhausted the field of inquiry that it is difficult to find any pathway that has not been already well trodden. This is a great mistake. Unexplored virgin territory enough to occupy the whole of mankind for ages lies about us on every hand. Often it is but a step from the broad highway of common knowledge to a vast and most inviting wilderness where the life may be spent in original discovery. To paraphrase a remark attributed to Dr. Abercrombie, what we don't know about this world of ours would make an Encyclopedia beside which the great *Encyclopædia Brittanica* would look like a *World's Almanac*.

Hence, apart from all question of enjoyment and the physical benefit yielded by a healthful out-door occupation, there is a demand for explorers in the field of bird music that should be heeded by all who are capable of responding. Hundreds of thousands of beautiful, unique, and interesting songs now "waste their sweetness on the desert air" and will die with the death of the singer. These songs, which would be of so much value and pertinency to the intellectual world, will, as matters now stand, be lost forever for lack of a recorder. With more students at work many such songs could be rescued from oblivion and made to serve a useful purpose in extending ornithological knowledge and aiding to supply a more substantial basis for philosophical speculation.

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A House Wren's Day

GILBERT H. TRAFTON

During the summer of 1913 the class in Nature-Study at the Mankato State Normal School kept a detailed record for one day of the feeding activities of a pair of house wrens which reared their young in a nesting house located on the writer's grounds. The class was divided into ten sections and each section watched the birds for an hour and a half.

The young wrens were two days old. The day was a typical clear summer day with the temperature 67 degrees at four o'clock A. M. In the afternoon there was a heavy shower.

The observations began at four o'clock. At that time the male was singing. At 4:23 the female came out of the nest, looked around and went back. This was repeated several times and the third time she flew away at 4:30, returning with food at 4:36, feeding twice before sunrise which occurred at 4:39. From then till after sunset the feeding was kept up with regularity thruout the entire day till 13 minutes after sunset, the female feeding twice after sunset. Thus the day of feeding extended from 4:36 till 7:58, a period of 15 hours and 22 minutes.

The birds were watched till 8:20, 35 minutes after sunset. At the time of the last feeding (7:58) the female entered the house and had not left at 8:20. The male flew away at 8:10 and did not return.

At the end of the day the records were summarized with the following results: The young birds were fed 238 times, 218 by the female, 18 by the male, and on two visits the sex was not determined.

The following table shows the summary by hours:

TIMES FED

Hour	By female	By male	Sex undetermined	Total
4:30–5	6	0		6
5– 6	20	1		21
6– 7	17	0		17
7– 8	14	1		15
8– 9	15	0	2	17
9–10	19	2		21
10–11	14	0		14
11–12	12	1		13
12– 1	17	2		19
1– 2	10	1		11

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TIMES FED—*continued*

Hour	By female	By male	Sex undetermined	Total
2– 3	17	2		19
3– 4	13	4		17
4– 5	16	1		17
5– 6	8	0		8
6– 7	10	1		11
7– 8	10	2		12
Total	218	18	2	238
Average per hour	14	1		15

An effort was made to determine the kind of food fed to the young, but this could not be done very accurately, except to note that most of the insects were small, and that caterpillars were brought frequently.

The longest time between any two consecutive feedings was 12 minutes, except during the shower when a period of 16 minutes elapsed. The shortest time between two consecutive feedings by the same parent was one-half minute. The female fed four times in four minutes, and on one occasion fed three times in a minute and a half. Frequently there was only one minute between two consecutive visits of the female. Often the male and female would feed one immediately after the other.

The male was singing during most of the day. Frequently he sang with an insect in his bill, sometimes waiting several minutes before feeding the young. Three times during the day he drove away a red squirrel, and once another wren.

During the remainder of the time that the young were in the nest they were watched occasionally from day to day for short periods with the following results:

NUMBER OF TIMES FED

Date	Time	Age of young	By female	By male	Sex unknown	Total	Nest Cleaned
July 4	12–1	5 days	12	7		19	
July 6	12–1	7 days	11	3	2	16	6 times
July 11	5–6 P. M.	12 days	12	10	3	25	5 times (After a
July 13	9–10	14 days	10	12		22	6 times storm)
July 13	1–2	14 days	11	10		21	4 times
July 13	4–5 P. M.	14 days	8	6	2	16	4 times
July 13	6–7 P. M.	14 days	10	10		20	2 times

On July 14 the young birds left the nest.

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As shown by the above table, on July 13, when the young were 14 days old, the birds were watched for four hours at different times of the day, showing an average of 19¾ feedings per hour. For the day of 15⅓ hours this would mean 303 times per day. Taking the average between this and 238, the times the young were fed when 2 days old, we get 270 times as the average number of times the young were fed daily during the period they were in the nest. Multiplying this by 15 the number of days in the nest, we get 4050 as the total number of times the young were fed. As the parents often brought more than one insect at a visit, the rearing of this wren family meant the destruction of from four to five thousand insects.

The largest number of times the young were fed in an hour was 25, immediately after a storm when the young were 12 days old. The smallest number of times was eight during a heavy shower when the birds were two days old.

Some differences were observed between the male and female in their activities and habits. During the first days of rearing the young, most of the feeding was done by the female alone, but later more assistance was given by the male, until on the last day the work was about equally divided between them.

During one day the male always left and entered the tree to which the nesting house was fastened by the east side, while the female came from the west side. On another day they both came from the west side.

On all occasions the female approached the house directly, flying at once to the entrance, frequently disappearing inside before one could focus the field glasses on the house. On the other hand, the male approached gradually, hopping from twig to twig, and singing sometimes waiting five minutes, and on one occasion 11 minutes, before feeding the young. Sometimes he waited till the female returned and then fed immediately after she left.

Sometimes the female remained in the house for periods varying from one minute to six minutes. The male always came out immediately after feeding.

The following data, furnished by Edward Uehling for two pairs of wrens which he observed, shows the total time occupied by the wren from the time of beginning to build the nest till the young leave it.

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Date of starting	May 8	May 18
Time to build nest	8 days	7 days
Time to lay eggs (7)	7 days	7 days
Time to incubate eggs	13 days	11 days
Time young are in nest	17 days	14 days
Total time	45 days	39 days

It will be noted that the birds which began to nest later in the season completed their work six days quicker than those which began earlier.

One of these nests was found to contain 1000 sticks. As the nest was completed in seven days, that would mean that about 150 sticks were brought in one day, or 10 per hour.

During the summer of 1914 a pair of Baltimore orioles was watched in a similar way for a day, with the following results:

TIMES FED

	By female	By male	Total
4:45– 5:45	11	9	20
5:45– 6:45	12	8	20
6:45– 7:45	14	10	24
7:45– 8:45	10	8	18
8:45– 9:45	9	11	20
9:45–10:45	5	8	13
10:45–11:45	16	9	25
11:45–12:45	10	9	19
12:45– 1:45	8	4	12
1:45– 2:45	8	8	16
2:45– 3:45	8	5	13
3:45– 4:45	13	10	23
4:45– 5:45	9	13	22
5:45– 6:45	7	8	15
6:45– 7:45	11	10	21
7:45– 8:15	3	1	4
Total	154	131	285
Average per hour	10	9	19

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Bird Records

Bird records are kept by hundreds of people. They may serve only to satisfy the desire of the observer to keep a record, regardless of its value, or they may be made with the definite purpose of furnishing data from which to determine more accurately than we now know, the migratory movements of our birds.

The former motive is praiseworthy, since it stimulates observation, and, consequently leads to growth on the part of the observer; the latter is more praiseworthy since it adds to the sum of human knowledge.

The records commonly made consist of casual, or chance observation, on the date of arrival of the species known to the observer. He chances to-day to see a robin and notes religioulsy the date, and compares it with that of its arrival the year before. To-morrow he sees a grackle and records and compares. As the season advances, his enthusiasm wanes and by the time the leaves are out, and observations become difficult, his interest has expended itself and he lays away his record book. The late arrivals are missed entirely and the fall migration is as if it were not. However, we are not belittling such records. They are commendable in the same principle that one must walk before he can run. One must learn the birds one by one, and this is frequently a laborious process; or, at any rate, it ought to be if carefully done. Its means constant attention to details, critical comparison, and these mental operations require effort, pleasurable though they may be.

And here let emphasis be laid upon the necessity for close observation. The enthusiast, without contemplating its consequences on himself and others, too frequently, after momentary observation of a bird not known to him, begins to turn the leaves of his key, studying first this and then another description, wavers between two or more possibilities, becomes, by suggestion, prejudiced toward one or the other, and finally concludes that the bird seen must have been of a species thus and so. Thereupon his record receives another addition—and, in this manner, grows apace. Oppose to this attitude and method that of the observer who witholds his judgment until observation, repeated if necessary many times, confirms beyond peradventure, his identification of an unknown bird. His records grow more slowly, it is true,

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but have that most desirable of all qualities—reliability. The size of the record is not a criterion of its value.

And so, in the matter of birds records, let us strive not so much for a large record as an accurate one. This habit, it is psychologically interesting to know, leads most surely to the desirable end of attaining a wide acquaintance as represented in a large record. Accuracy first and accuracy last, is the prime essential. Better incomplete than an imperfect record.

The large record implies an extensive acquaintance with birds. But even here we need in most cases, a more definitely organized plan. All too frequently the purpose, as we have stated, is merely to demonstrate one's avian knowledge by presenting to admiring or pitying friends a list of birds observed during the season. This end is, no doubt, attainable by any person with average intelligence.

But our knowledge of bird habits could be greatly augmented were our efforts better organized toward that end. Thus, it is useful to know that a given species occurs, in a given locality, but it is equally so to know when, in the main, it arrives, and when it leaves. Were observations at many different places thus systematically and accurately made, we would be supplied with data from which to learn much concerning migratory movements. It is granted, of course, that many such records are being made, but that we need more, is also to be emphasized. It is desirable to know if habits are changing, if migration routes are being modified, and if so, how much, and why. These problems have broad biological bearing. Accurate and extensive studies are then desirable.

Systematic studies thus carried on are not only interesting to the bird lover, but at the same time may be valuable as scientific data. That such records require more time and regularity of observation than would otherwise be true, is readily understood. However, once you are into it, you will find yourself impelled to continue.

A method of making records is involved. Such a scheme as will facilitate recording the needful facts has been tried out by the writer, and is here suggested for the benefit of those who may be interested.

Two sets of cards are used, of the usual 3-inch by 5-inch size. The first may be called the Field Card (fig. 1) and a set may easily

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be carried in one's pocket bound between board covers. By means of these cards, as examination will show, a record may by kept of the daily observations, together with weather conditions, time of day, date, etc. The left hand column may be used entirely for the recording of the species, names, and the right hand column for remarks concerning abundance, place of observation, etc.; if mere identification be desired, both columns may be used for species names. The reverse side of the card is ruled also and may receive records in the same way. These field records may then be filed as made.

Place	Date 191.....	Weather	Temp. °	Time

Name of Bird	Remarks [or Bird names]

No. 1 Observer.....

The migration record is made on another card (No. 2), which provides for both spring and fall appearance. It is commonly customary to record the first appearance of any member of a species as being typical of its kind. This is seldom true, since stragglers frequently wander well ahead of the main body, and their appearance does not, therefore, mark the main advance. Herein lies the advantage of the Field Records on which one may find, if they be well made, not only the date of first appearance, but also that of maximum abundance. To make this distinction in the record clear, two dates may be used on the Migration Card, the first date for the first appearance, and the second to mark the crest of the wave.

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It will be observed that the fall movement may be treated in the same manner, and be compiled by inspection of the Field Records. The first date may indicate the time of marked diminution, or conspicuous flocking, and the second that of the disappearance of the belated stragglers.

It is admitted, assuredly, that records kept in this fashion demand constant field work throughout the migration period. It is particularly difficult to carry on the work in the fall when change of plumage, and silent passage characterizes the transients. With permanent residents the case is but slightly different

Genus	Species	Common name

Observations made at		No. A. O. U.
SPRING		FALL
	1911	
	1912	
	1913	
	1914	
	1915	
	1916	
	1917	
	1918	
	1919	
	1920	

No. 2

since so many betake themselves to the thickets and are likely to escape detection. However, knowledge of their habits will enable one to note marked decrease in numbers, and thus detect the beginning or the end of the local migration.

To emphasize the need of more careful and well directed and organized efforts in making records may serve as the closing thought. Constancy and earnestness are required to carry them on as we have suggested but by as much as the effort needed excells that of the ordinary casual way, so does the result transcend in value that usually attained.

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List of Birds

Amazement is frequently shown by the uninitiated when told that at least 150 different kinds of birds may be found in a given locality. After learning even a score or so of those formerly outside of his ken, the young bird student is wont to remark that he never thought that there were so many birds.

The following list is submitted by Mrs. C. E. Raymond, of Chicago, as having been seen by her during the year 1914 within 20 miles of the city of Chicago. It is an interesting record, and omitting the distinctly aquatic species, might be duplicated in scores of other cities and towns as well as in the country where woods and streams are to be found.

The birds marked * are found occasionally; those marked † are fairly frequent visitors, while those unmarked are commonly seen.

Pied -billed Grebe
†Horned Grebe
†Common Loon
American Herring Gull
†Ring-billed Gull
†Franklin Gull
Bonapart Gull
†Carpian Tern
Forsters Tern
Common Tern
*Least Tern
Black Tern
American Merganzer
Red-breasted Merganzer
*Hooded Merganzer
Mallard
†Gadwell
†American Widgeon
†Green-wing Teal
Blue-wing Teal
Shoveller
Pin-tail
American Scaup Duck
*Ring-neck Duck
American Golden-eye
*Buffle-head Duck
†Old Squaw Duck
*Ruddy Duck
Canada Geese
American Bittern
Least Bittern
Great Blue Heron
Little Green Heron
Black-crown Night-heron
King Rail
Virginia Rail
Sora Rail
Florida Gallinule
American Coot
*American Woodcock
Wilson's Snipe
Pectoral Sandpiper
Least Sandpiper
†Red-backed Sandpiper
*Semi-palmated Sandpiper
Sanderling
Greater Yellow-legs
Lesser Yellow-legs
Solitary Tattler
Bartramian Sandpiper
†Buff-breasted Sandpiper
Spotted Sandpiper
*Black-bellied Plover
†Golden Plover
Ring-necked Plover
Killdeer
†Ruddy Turnstone
†Quail
*Prairie Hen
†Ring-neck Pheasant
Mourning Dove
†Turkey Vulture

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Marsh Hawk
Sharp-shinned Hawk
Coopers Hawk
*Red-tailed Hawk
*Red-shouldered Hawk
*Broad-winged Hawk
*American Rough-legged Hawk
†Bald Eagle Hawk
†Pigeon Hawk
American Sparrow Hawk
†Goshawk
Short-eared Owl
†Saw-whet Owl
Screech Owl
Yellow-billed Cuckoo
Black-billed Cuckoo
Belted Kingfisher
Hairy Woodpecker
Downy Woodpecker
Yellow-bellied Sapsucker
Red-headed Woodpecker
Flicker
*Whippoorwill
†Western Poor-will
Night-hawk
Chimney Swift
Ruby-throated Humming Bird
King Bird
Great-Crested Flycatcher
Phoebe
*Olive-sided Flycatcher
Yellow-bellied Flycatcher
Acadian Flycatcher
*Traill's Flycatcher
Least Flycatcher
Wood Pewee
Horned Lark
Blue-Jay
American Crow
Bobolink
Cowbird
†Yellow-headed Blackbird
Redwing Blackbird
Meadow Lark
†Western Meadow Lark
†Orchard Oriole
Baltimore Oriole
Rusty Blackbird
Bronze Grackle
*Purple Finch
House Sparrow
American Goldfinch
*Pine Siskin
Lapland Longspur
Smith Longspur
Vesper Sparrow
Savannah Sparrow
Grasshopper Sparrow
Henslows Sparrow
†Lark Sparrow
White-crowned Sparrow
White-throated Sparrow
Tree Sparrow
Chipping Sparrow
Field Sparrow
Song Sparrow
Lincoln's Sparrow
Swamp Sparrow
Fox Sparrow
Junco
Chewink
Cardinal
Rose-breasted Grosbeak
Indigo Bunting
Black-throated Bunting
Scarlet Tanager
Purple Martin
Cliff Swallow
Barn Swallow
Tree Swallow
Bank Swallow
Rough-wing Swallow
Cedar Waxwing
Loggerhead Shrike
Red-Eyed Vireo
*Philadelphia Vireo
Warbling Vireo
Yellow-throated Vireo
Blue-headed Vireo
Black and White Warbler
*Prothonotary Warbler
Golden-winged Warbler
Nashville Warbler
Tennessee Warbler
Parula Warbler

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Cape May Warbler
Yellow Warbler
Black-throated Blue Warbler
Myrtle Warbler
Magnolia Warbler
Chestnut-sided Warbler
Bay-breasted Warbler
Black Poll Warbler
Blackburnian Warbler
Black-throated Green Warbler
†Pine Warbler
Palm Warbler
Connecticut Warbler
Mourning Warbler
Wilson's Black-cap Warbler
Canadian Warbler
Oven Bird
Water Thrush
Grinnell's Water Thrush
*Yellow-breasted Chat
Md. Yellow-throat
American Redstart
Catbird
Brown Thrasher
†Berwick's Wren
House Wren
Winter Wren
*Short-billed Marsh Wren
Long-billed Marsh Wren
Brown Creeper
White-breasted Nuthatch
Red-breasted Nuthatch
Chickadee
Golden-crown Kinglet
Ruby-crown Kinglet
Blue-gray Gnatcatcher
Wood Thrush
Wilson's Thrush
Gray-cheek Thrush
Olive-back Thrush
Hermit Thrush
Robin
Blue Bird

Bird-Study at the Northern Illinois State Normal School

JESSIE R. MANN

Photographs by Ralph E. Wager

Springtime is bird-time, the happiest time in all Nature's calendar for those who love the out-of-doors. Even in February the brave little song sparrow is on our campus flinging out his cheery song over the melting snow. Robins, bluebirds, and meadow larks soon follow him and by the first of April we are seeing a new-comer nearly every day. Some remain with us only a few days or weeks, others choose their nesting places among our honeysuckles and spirea or in the elms and willows and spend the summer.

Grackles are our most numerous (tho not our best loved) birds and nest in greatest number. They have quite preempted a thicket of hawthorn trees and more than twenty nests can be counted in a small area. The denser the thicket the nearer together are the nests placed. During the time nestlings are being

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cared for the parents protest in chorus if an intruder enters their domain.

Upper—Grackle feeding young a white grub.
Lower—After feeding young.
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Each season the Nature-Study classes select some conveniently placed nest for all-day observation. Going at early morning, as soon as it is light enough to see objects, the observer for that

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hour takes his place near the nest with pencil and paper ruled to receive the records, to watch and make note of all that occurs. After an hour another observer takes his place and so on until dark closes the birds' working-day.

The following is such a record of a grackle's nest observed June 26, 1913: The nest was about eight feet from the ground and contained four young birds, probably eight days old. The observations began at 3:50 A. M. when it was not yet light under the trees.

Grackle on nest.

The parent birds were awake, however, and immediately began demonstrations that called in several of their neighbors, all of whom began hopping from branch to branch and uttering "chut" —"chut"—"chut." At 4:20 it was light enough to see that the female held an insect in her beak which she was too much disturbed to give to her nestlings. More birds gathered and the excitement increased for half an hour but gradually all but the parents left to attend to their own family duties. At 5:00 the female still held the insect but later dropped it. I did not go to the nest till 6:42.

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RECORD

No.	Time	♂ ♀	Kind of Food	Remarks
1	6:42	♀		Seemed to be cleaning nest.
2	6:42½			Seemed to be cleaning nest.
3	6:42½	♀		Seemed to be cleaning nest.
4	6:48	♂ or ♀	Food	Couldn't see.
5	6:52			
6	7:00	♀		
7	7:20	♀ ♂	Worms?	Came to tree but didn't go to nest.
8	7:27	♀ ♂	Food	Stayed three or four minutes.
9	7:35			Came to nest and fed.
10	7:41	♂ ♀		Both fed large mouthfuls.
11	7:50			
12	8:10	♀		Both came to tree but ♀ fed.
13	8:42	♀		Came near the house, but seemed frightened and flew away.
14	8:47	♀		Fed a worm to one bird and flew away.
15	9:05	♀		Fed a worm to one bird and flew away.
16	9:25	♀	?	Fed two and left.
17	9:40	♀	White grub	Divided between three birds.
18	9:50	♀	o	Did not feed.
19	10:00	♀	Worm?	Fed two.
20	10:08	♀	June bug	Fed one after waiting five minutes, remained "chucking" nearby for a time.
21	10:18	♀	1 June bug	Consumed five minutes in hopping about. Fed one; a large mouthful for it to swallow. Cleaned nest; flew; came again; flew; remained near "chucking" vigorously over my head and jerking tail. I moved and it flew away.
22	10:30	♀	1 June bug	Came much more quietly. Put the beetle into one's mouth, took it out and fed it to another. Cleaned nest and left quietly.
23	10:42	♀	1 June bug	Came with less fear; fed and left.
24	10:48	♀	1 White grub	Divide between two birds.
25	11:00	♀	1 June bug	Gave to two and stayed quite a while chucking over my head.
26	11:15	♀	1 Grub	Stoped over my head several minutes, then gave it to two birds.
27	11:18	♀	1 June bug	Came very quickly, gave it to three birds. Stayed near several minutes.
28	11:40	♀	1 June bug	Divided bug between two. Chuckled a while and then flew away.

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No.	Time	♂ ♀	Kind of Food	Remarks
	12:00	♀	1 June bug	Came more quietly and fed it to two and then flew away.
29	12:05	♀	June bug	Gave to four birds. Cleaned nest and stayed around it for about five minutes and then flew away.
30	12:22	♀	1 June bug	Came at 12:06 and waited quietly. Fed three, dividing bug and gave to first one then the others.
	12:47	♀	2 June bug	Came at 12:27 and waited until 12:47. Fed two birds, then left.
	12:58	♀	1 June bug	Back at 12:54 with June bug away at 12:57, back at 12:58, away again.
	•			Returning with same bug. Fed at 1:01, dividing bug between two birds
	1:10	♂ ♀	1 June bug	Returned at 1:10 with June bug, dividing the bug among three, staying several minutes at nest. ♂ at 1:23 with small morsel divided between two. Left immediately.
	1:25	♀	June bug	Returned at 1:29 staying quietly for some time. Left at 1:45 with food still in beak. Returned at once bringing food; fed two. Seemed nervous. Jerked tail and did a great deal of chucking.
	2:10	♀	1 June bug	Fed only one, but put empty bill into other one's mouth.
	2:30	♀	3 grubs	Fed three birds; took refuse from nest. Came back in short time and took more refuse from nest.
	2:36	♀		Two more trips after refuse.
	2:46	♀	June bug	Fed one bird. Flew away.
	2:54	♀	Food	Fed one; seemed become nervous; made second trip without apparent reason. Chirped a great deal.
	2:57	♀	Food	Fed two birds, left and came back immediately.
	3:00	♀	Food	Fed three birds.Food looked to be bread; protruding far out from bill.
	3:15	♀	June bug	Fed one bird she seemed very kindly.
	3:20	♀	Grub	Fed this worm to three of the birds and then ate part herself.
	3:35	♀	Food	Came to three with food but seemed frightened and flew away.
	4:03	♀	Grub	Fed two birds; flew away.

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No.	Time	♂ ♀	Kind of Food.	Remarks
	4:07	♀	June bug	Wren appeared on a branch close by and small birds called for mother who came bringing food which she gave to birds.
	4:12	♀	Grub	Fed three birds.
	4:46	♀	June bug	Fed two birds; sat on branch five minutes before feeding them.
	4:49	♀	June bug	Fed three birds.
	5:00	♀	June bug	Fed two birds; left immediately with refuse from nest. Came back for a moment.
	5:08	♀	June bug	Fed two birds.
	5:16	♀	June bug	Fed three birds, leaving immediately.
	5:21	♀	June bug	Fed two birds and then flew to nearby tree and sat for only a moment.
	5:28	♀	June bug	Fed three birds and left with waste from the nest.
	5:42	♀	June bug	Fed two birds and left at once.
	5:50	♀	Food	Returned with food but flew to nearby tree without feeding any young.
	6:00		June bug	Returned to tree with food. Fluttered a while then fed three. Flew away.
	6:12	♀	June bug	Fed two young. Flew away.
	6:30	♀	June bug	Fed all young some of it.
	6:38	♀	Grub	Fed to all young a portion saving some for herself.
	6:40	♀	Grub	Fed two young.
	6:51	♀	June bug	Returned with food and fed it to two of the young.
	6:55	♀	Grub	Returned with food and gave it to one.
	6:58	♀	June bug	Fed two and left at once quietly.
	7:01	♀	Grub	Fed one and left at once.
	7:06	♀	Grub	Divided among three.
	7:12	♀	June bug	Fed three, inspected the nest and left.
	7:35	♀	?	? Dark

SUMMARY

First feeding 7:35 A. M. (This would normally have occurred much earlier. The birds had not become accustomed to the presence of the observers).

Last feeding, 7:35 P. M.

Feeding time, 12 hrs. (Normally about 15 hrs.)

Number of trips, 61.

Average time between trips, 12 min.

Longest time between trips, 35 min.

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Shortest time between trips, 4 min.
Male fed only once after the morning excitement subsided.
Insects brought

White grubs	12
June beetles	35
Unidentified	14
Total	61

The large number of June beetles and their larvæ fed is explained by the fact that a small piece of grass land not .60 rods distant had just been plowed.

White grubs are classed as injurious insects. They spend their entire larval life of two years in the ground feeding on the roots of grasses and sometimes strawberries and other garden plants. Sod corn is often injured by them. Here was, therefore, an excellent illustration of the economic value of birds, even the questionable grackle, as insect destroyers. Information gained in this way means vastly more than that read from books. Thru such studies we gain an intimate and first-hand knowledge of bird-life in its most interesting aspect. We have looked into the family life of our "little brothers" as it were, tho we were uninvited guests, and shall ever after have a deeper sympathy with them and with all living things.

Some Common Mosses

First Paper

A. J. GROUT

Funaria and Physcomitrium

The common names applied to mosses by common people are few. Most of the so-called popular names are in reality made up by experts for popular consumption only. As a rule the scientific names are about as easy to learn as the others if one would only think so.

Physcomitrium turbinatum (Mx.) Brid. is often called the "Urn Moss" because the dry and empty capsule is urn shaped. But before we go further in our consideration of this moss let us get our bearings by a little general description of the characters of mosses.

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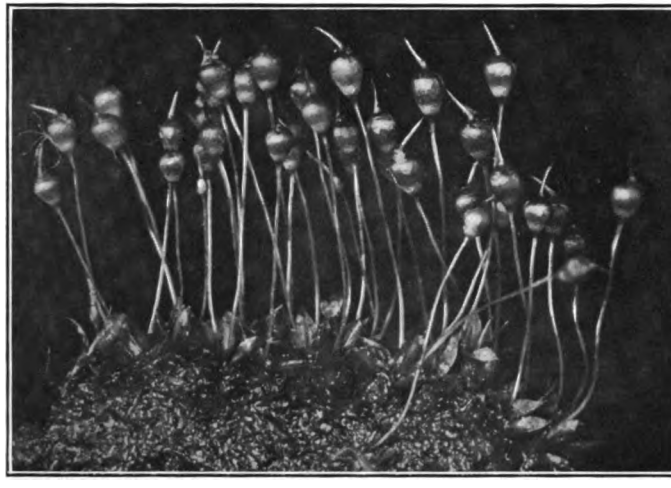
The moss plant, like the higher plants has a stem bearing leaves; and it has at the base of the stem long slender threads that do the work of roots though they are much more like the roothairs of the higher plants, as they are only one cell in diameter though several cells long. These are called rhizoids.

Mosses are spore plants, that is instead of producing seeds they reproduce by tiny single cells called spores. These spores are produced in a tiny "*capsule*" which is borne on a stalk called



Physcomitrium turbinatum X 4

"*seta*" or sometimes pedicel. Seta and capsule are frequently referred to as "*fruit.*" The fruit is the most conspicuous and characteristic thing shown in our cut of *Physcomitrium*. This moss is chosen as the first to be studied because it is common in early spring, not only in the country but in lawns, parks and roadsides in and near our cities. It grows on moist soil (preferably somewhat shaded) that is not closely grassed over; and it often nearly covers neglected ploughed fields. *Physcomitrium* apparently is an annual moss taking about a year to develop fully from the spore.

To get it like that shown in the photograph you should look for it in late April or early May, in the vicinity of New York City, and in other localities according to the season as compared with New York. Look when the common blue violets are in full bloom.

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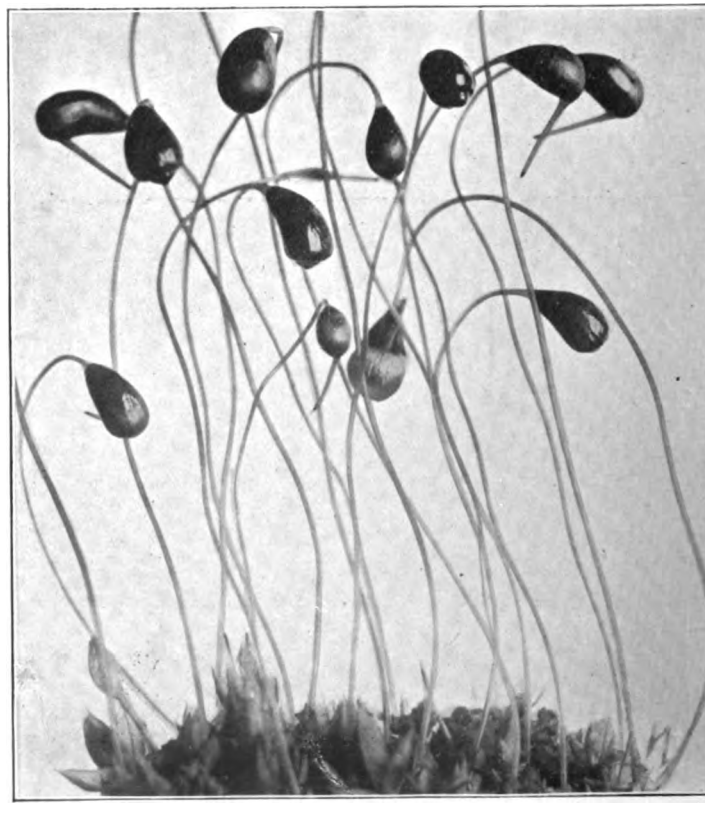
If collected at this time there will be found on the top of each capsule a little cap (calyptra) as shown in the photograph. This soon falls off and a little later the capsule opens by a small lid



Funaria hygrometrica X 4.

which comes off much like the lid of a pot or kettle and the lid has in the middle a little knob ("beak") like a fairy handle for the lid.

When the lid falls from the capsule the wind and small animals like mice, insects, etc., in fact any moving thing that touches the plants, shake the tiny spores all over the moist ground. If you break open a ripe capsule you can see the spores like fine brown dust.

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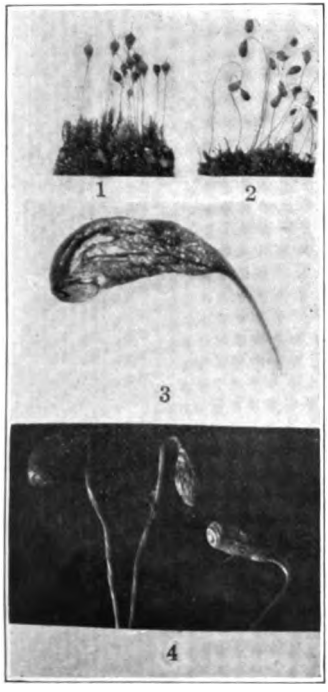
When the spores fall upon moist warm earth each sprouts and sends out a tiny green thread much as the pollen grain when germinating sends out a pollen tube. Indeed botanists tell us that the pollen grain is but a modified spore. These green threads from the spore branch again and again until they form a thin green network ("*protonema*") over the surface of the soil. From this protonema spring tiny buds which develop into the plants of the next season.



1, Physcomitrium turbinatum X 1; 2, Funaria hygrometrica X1, rather small for the species; 3, capsule of F. hygrometrica X 9; 4, capsules of Funaria flavicans X 4.

Go into a greenhouse and you will see the soil on beds and pots covered with this green felt of protonema. Some algae produce a similar green felt in greenhouses but on the true protonema little moss plants can usually be seen if one looks closely. These greenhouse mosses are more likely to be of some other moss than Physcomitrium but the method of development is the same. Spores, however, are not necessary here for every bit of protonema broken off in moving the soil is capable of developing like a spore.

In searching for the Urn Moss you may come upon young plants of the "Cord Moss" *Funaria hygrometrica* (L.) Sibth., looking like the very young plants in the photograph, a slender lance from a cluster of tiny leaves at the base.

Funaria grows in situations such as *Physcomitrium* affects, but it specially favors ash piles, rubbish heaps, and spots which have recently been burned over. About a month after *Physcomitrium* is mature look for Funaria. Note how the calyptra is tilted to one side by the unequal growth of the capsule as it nears maturity.

Funaria is called the "Cord Moss" because its seta when dry is twisted like a rope. If one of these dried plants be put in hot

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water the seta will untwist so fast as almost to make you dizzy. I once soaked up some plants in order to try to photograph them plump and full, but during the rather long exposure the setae twisted so that I got only a blur where the capsule should have been.

This twisting of the seta in drying occurs in most mosses and is probably a device to help scatter spores.

Funaria has a lid like *Physcomitrium* but it is to one side of the queer bent capsule and when it comes off there lies underneath a very tiny fringe of two rows of teeth sixteen in each row. The teeth of the outer row are beautifully figured and colored and one should examine them under the compound microscope, if possible.

These two rows of teeth form a sort of sieve which keeps the spores from all dropping out at once from the downward turned mouth of the capsule. When dry and empty the capsules wrinkle and twist in curious and interesting shapes.

We have another fairly common species of Funaria (*F. flavicans* Mx.) distinguished to the eye chiefly by the differences in the capsules shown in the cut.

Bird Study in the Grades

EMELYN CLARK
Mendota, Ill.

Since the economic importance of birds is coming to be understood we realize that the study of birds and their protection is a necessity in both town and country. Of all methods of bird study the one which yields the quickest and most lasting results is one which puts children to work doing something.

Whether boys care for birds or not they like to hammer and saw, tear things to pieces and put them together another way. Feeding shelves, bird shelters, and bird houses are suitable subjects for such activities. Both boys and girls enjoy making bird houses. Quite aside from the value to the birds, the pleasure the children take in making plans, their zest in the competition for utility—and here is a fine place to invite competition—their delight in seeing each house completed and chosen by some pair of wrens or bluebirds as

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the prettiest and best in all the town or country round,—these things in themselves are worth while.

Then too, when a child has established a feeding place and attracted birds to it he has much to tell about his chickadees, downy woodpecker, and feels genuinely downhearted when they accept other hospitality even for a day or two.

The boys of one of our manual training classes took especial pleasure in making the bird-houses since they were allowed to formulate their own plans and to carry them to completion, much to their own individual tastes. They were cautioned that the wrens, small as they are, still like plenty of houseroom; that English sparrows must be kept out by making the entrances no larger than a quarter; that this entrance should be about six inches above the floor; birds like to enter through their window—and that birds dislike paint preferring a well weathered house. After such suggestions their fancies ran freely and helped them to plan houses individual and beautiful while at the same time, in most cases, very simple. Cracker boxes furnished much of the lumber, and bark from the railroad ties much of the finish.

There are various sources of information about bird shelters, feeding shelves and houses in *Bird Lore*, pamphlets published by the Audubon Society and many other magazines. Such furnish excellent material for the reading shelf in the school room and are used with no little interest.

In teaching children to love and protect the birds it is usually necessary to say but little about what should not be done if they are persuaded in some way to do the things they should do. The boy who makes a bird house will have more respect for birds and less desire to destroy them. If children wish to encourage the presence of birds about their homes they will not consciously permit conditions which drive them away. But most children do not realize the great damage done to birds by the housecat and the stray cat, as well as the English sparrow. Boys usually show no hesitation in their dealings with the English sparrow when given a reasonable excuse for attack, while many girls do not object to destroying their untidy nests. In regard to the cat, on the other hand, there is a strong prejudice which makes instruction concerning her relation to the birds and its solution a subject which requires tact and patience and downright skill. It is difficult for

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most children to realize what harm cats do to birds until they, themselves, make careful note of it. But even then many children and perhaps as many grownups regard the cat as highly as the birds, and esteem her so valuable as a pet that the question of getting along without cats is perhaps better omitted until the children come finally to value birds at their true worth. Debates on the subject are not only interesting but profitable.

But in order that children shall make friends with the birds they must become well acquainted with them. For this the first and greatest requisite is a teacher who knows and loves birds. Her enthusiasm and joy will be her best helpers.

There are many ways of getting the children to make their aquaintance. A search through the books on the subject in the public library will often reveal unexpected help and inspiration. A Nature Chart is a valuable addition to one's equipment if the pictures are not too highly colored. One in our building has been kept in almost constant use for several years. The children like to look at it on rainy day recesses. It is a friend in time of need when some child reports a bird the like of which never was on land or sea. For children will persist in seeing tropical birds! Another help is found in the various bird societies such as Junior Audubon and Liberty Bell. The cost of joining is little or nothing and the benefits great. I have always found children eager to join. The colored pictures sent to members of the former are often the beginning of a fine collection which is most valuable if it be of common birds. The badges are very popular.

As children become interested in birds it is a good plan to keep in some prominent place in the room, a record of the birds seen in the vicinity with separate places for winter residents, migrants, and summer residents. Or again, the chart may contain simply the names and the date on which each was first seen. Unless one is careful to insist on absolute accuracy of identification, however, the children's tendency to see with their imaginations and to jump at conclusions will prevent their ever obtaining that sense of keen satisfaction which is given by positive knowledge, not guess work —in identification.

Then when spring really arrives there comes an added inspiration to nature-study—a free use of the out-of-doors. Then the record shows new arrivals almost every day. Then the nests are being

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built and the bird houses occupied. There is much to see in woods and fields, and trips thither should not be neglected. These tramps if properly conducted, are the best part of bird study. Provided the day is warm and beautiful and the children properly dressed for a walk in the dew, the early morning is the time of times for them. Severity is occasionally necessary to enforce the wearing of rubbers and wraps. After school excursions are also helpful, for, although the birds do not show themselves so much, there are fewer objections in regard to damp, cold and early rising. But at any time a noisy boy or girl will spoil everything and if he be of the irrepressible kind he is better left at home. The teacher who accompanies need not know all, even of the more common birds. She, like the children, must manifest a desire to learn. Bird or field glasses are a great help in identifying new or somewhat uncommon birds but it is a fine thing to acquire the ability to recognize birds by their characteristic habits, and to gain the power to see with the naked eye the little identifying marks and to recognize readily individual songs. And with the love of the song and its singer will come the desire for such protection as every young American owes to his useful friends the birds.

Editorial

We cannot resist expressing ourselves with reference to a certain phase of bird-study as it is commonly carried on in school. Not that we deplore its popularity, since there is really a need for more of it; nor that we believe it insincerely dealt with since teachers are in earnest about it. But there is a certain aspect of it that is open to criticism, and while calling attention to it we desire at the same time to acknowledge the many valuable elements everywhere to be found in it.

We refer to the well-nigh universal practise of trying to teach people birds by the use solely of pictures and books. Nor here again would we be misunderstood, since pictures and books undoubtedly have their proper place. But why, pray tell us, undertake to teach a child to recognize a blue-jay by inspection of a picture when blue-jays are everywhere about him? Why assume that if he can name a double score or more as he sees them on painted cards that he will recognize one-tenth that number when he sees them in the open field or woods? Did you ever try it? Not only so, but it is useful also to remember that a name is

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designed primarily to delineate an idea. It stands for something. It is not that thing but stands for it. A child is shown a colored picture of a blue-jay, is expected to describe it as expertly as he can, and is finally told that it is a blue-jay (seldom qualifying the notion by the statement that it is a picture of a blue-jay). The word blue-jay thereupon becomes associated with a combination of colors on a cardboard—and not with the blue-jay himself for which the picture stands. Multiply this result by as many pictures as you thus hold before him, and you have the product of so many names associated with as many pictures—and all minus the notions which are alone worth while—those clustering about the bird as a living, active, result-producing creature.

Against all of this you will doubtless retaliate by asking how you are to get your children to know the birds unless you do it in this way? To this query we would immediately oppose another and ask you if you are sure that they know the birds when you undertake to teach them in this way? It is admitted that names may be rightly affixed—sometimes—by first learning them in connection with the study of pictures. But the bird is more than a name. It is a living thing with powers and habits peculiar to itself, and these can never be learned from the inspection of a picture. Continuing your argument you would possibly then declare that by the use of pictures plus books of description and narration an adequate understanding of birds may be had. Adequate, we would reply, as pure intellections. But such studies are dead; they are like the body with the spirit gone from it; they do not lead to a *realization* of the truth. They are outlines only of the whole picture, the colors, the lights and shadows which give perspective, and the details of which are added by the movements and song of the bird; by leaf and tree and flower; by waves beating the shore; by meadows and marshes; by the warm sun of spring and the cold of winter; by all the appealing forces of the great out-of-doors.

And so, disregarding the appeal of the real bird as an object of study, interests become shallow or transient, facts learned from books are speedily forgotten, and the whole thing lacks the element of reality.

Nor are we to forget, in this connection, that the child is instinctively interested in the things of Nature. He is interested in birds; in the real living bird, and this interest ought surely to ripen with the years. Thrice blessed the lad who has

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"Knowledge, never learned of schools,
Of the wild bee's morning chase,
Of the wild flower's time and place,
Flight of fowl and habitude
Of the tenants of the wood;
How the tortoise bears his shell,
How the woodchuck digs his cell,
And the ground-mole sinks his well;
How the robin feeds her young,
How the oriole's nest is hung;

* * *

For, eschewing books and tasks,
Nature answers all he asks,
Hand in hand with her he walks,
Face to face with her he talks."

and out of this personal contact, saturated with feelings and emotions, develop life-long interests, permanent impressions, and an inspiring sense of reality.

Books and pictures have their place, but it is not that of so thoroughly displacing the bird itself. Let us begin and end with the bird. Growth stimulated by the use of the former is apparently more rapid, but it is not mentally the most healthful. Nature, after all, is the best teacher. R. E. WAGER.

* * *

You may be interested to know something about two of the contributors to this issue.

Mr. Carpenter, whose article on the tern has interested you is by profession a preacher; by avocation a student of birds. For twenty years he has been devoting his spare time, and we dare say, some not so spare, to the study and photographing of the birds of the marsh. He talks very interestingly about his experiences. His home is in Elgin, Ill.

Mr. Oldys contributes the article on bird songs. He was for some time connected with the Department of Agriculture at Washington, and became interested in the songs of birds from the musical side. These he has learned to imitate in a very realistic fashion. He is now devoting his time to writing and lecturing, with a reputation growing apace. His home is at Silver Spring, Md.

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ON BIRD STUDY

"There is a fascination about it quite overpowering. It fits so well with other things—with fishing, hunting, farming, walking, camping out—with all that takes one to the fields and woods. One may go a blackberrying and make some rare discovery; or while driving his cow to pasture, hear some new song, or make a new observation. Secrets lurk on all sides. There is news in every bush. What no man ever saw before may the next moment be revealed to you. What a new interest the woods have! How you long to explore every nook and corner of them!"

J. BURROUGHS.

St. Louis Section of the American Nature-Study Society

The first meeting was held at the Missouri Botanical Garden, Saturday, March 20th. The members were requested to assemble at the main gate at one o'clock. Mr. Thompson of the garden consented to conduct the party. The points of main interest were the new plant house, the desert plant house, the heating plant, the Shaw mansion. Questions were shot at Mr. Thompson.

Those wishing to do so availed themselves of the opportunity to study trees in their late winter condition and to note the early bird arrivals in Tower Grove Park. The party followed the central drive from Tower Grove Avenue to Grand Avenue.

The following trips are planned for the balance of the school year.

April 17, 1915, 1 p. m. Meramec Highlands—spring flowers and birds.

May 1, 1915. Clayton walk—May day—St. Louis County topography. Late spring flowers. Birds.

May 15, 1915. Onondaga Cave near Leasburg or Arcadia and Tronton region. Either trip can be made at a cost not to exceed $10. Any one thinking of making either trip will please notify Miss Carolyn Lefferty at the Harris Teachers College before May 1st.

June 5, 1915. Annual week-end meet. Leaving St. Louis Friday afternoon, returning Saturday or Sunday. Cost not to exceed $5. Members are asked for suggestions as to place.

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The Executive Committee adopted the following regulations for the proper execution of the financial side of the Section's affairs.

1. Members who wish to discontinue should notify Miss Carolyn Lefferty and at the same time, if in arrears, should remit for the sum due *The Nature-Study Review.*

2. Members in arrears for dues for more than one year shall be considered no longer in good standing and bill for *Nature Study* Review may be sent from office of publication.

News and Notes

The bird plate used as an insert in this issue, is a sample taken from the Bird Note Books prepared by Anna Botsford Comstock. They are extensively used in rural, city and normal schools, in training schools, in colleges and in nature-study classes.

The summer camp of the Georgia State Forest School, located on the Ocoee River near Blue Ridge, Ga., will the coming season be open to visiting teachers and lovers of nature. The location is an ideal one for a summer outing for a naturalist. It combines beautiful scenery amid fine mountain forests, with opportunity for recreation in the midst of a very great richness of both plant and animal life.

Professor J. B. Berry of Athens, Ga., is in charge.

We have always maintained that if we could read a person's notebook we should know the character—and tastes of the writer. Judged by this criterion Professor D. S. Hartline is a lover of nature and of literature. His outline for field notes includes The Heavens, The Weather, Mountains and Lakes and River, Plant Life, and Animal Life. Each of these divisions is marked by a special colored card in his loose-leaf "Seehearwrite" guide to taking notes in nature study; and under each division there are scientific subdivisions, and also apt quotations from standard poets and nature writers.

It is really an index to notes and enclosed in a neat cloth covered case roomy enough to include many extra pages of notes, and small enough to go into a pocket.

It is published by George E. Elwell & Son, Bloomsburg, Penn.

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For the Study of Mosses

Get Grout's Illustrated Glossary of Bryological Terms, - $0.10
or Mosses with a Hand-lens, - - - - - - 1.75
or Mosses with a Hand-lens and Microscope, - - 7.00
or any other book on the subject ever printed at an appropriate price.

Also botanical books of any kind and any date if obtainable. For example:
Tuckerman's Synopsis of N. Am. Lichens, Pts. 1 and 2, - $15.00
Farlowe's Marine Algae of New England, - - - 3.00

Mosses with a Hand-lens (224 pp., 8 vo., copiously illustrated) is a smaller book describing 250 mosses and 50 hepatics that can be identified by means of the Hand-lens alone. Specially adapted for beginners. $1.75.

"I....take this opportunity to tell you how satisfactory I find your book introducing students to the taxonomy of the Bryophytes." *Prof. Lincoln W. Riddle, Wellesley College.*

Mosses with Hand-lens and Microscope, bound in cloth, $.700, in half leather, $7.50. 8x11 inches, 416 pages, 88 full-page plates and 265 figures in the text. Printed by McFarland on the best coated paper.

"Must be considered the most important work that has yet been published on American mosses. No other book will be needed by any moss student except the specialist." *John Macoun.*

A. J. GROUT, PH. D., Author and Publisher,
New Dorp, Richmond Borough, New York City, N. Y.

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THE
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DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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VOL. 11 MAY, 1915 No. 5

Elementary Agriculture and Horticulture in Rural and Village Schools of Ontario, Canada

S. B. McCREADY

Director of Elementary Agricultural Education, Department of Education, Toronto

The story of the development of a scheme of teaching Agriculture in the elementary schools of Ontario is a long and interesting one. All the story cannot be told here. The sketching of a few outstanding features will show, however, the relationships between the past and the present and how our educational history in this matter is repeating itself.

Early Attempts to Secure Agricultural Instruction

When our system of public instruction was organized in 1847 under the superintendence of Dr. Egerton Ryerson, the training of teachers was provided for by the establishment of a Normal School in Toronto. Right at the commencement the teachers-in-training were given daily instruction in Agriculture by Mr. Hind, a mathematical and science master brought out from Ireland; oral and written examinations were held at the close of the term and a School Garden (not called by that name then however) containing an elaborate series of experiments and demonstrations on fertilizers, farm crops and methods of cultivation was conducted on the grounds of the model school which was associated with the Normal School. There must have been considerable public interest in the matter at the time, for Lord Elgin, the Governor General of the Province, known then as Upper Canada, donated prizes of £5 and £3 to the candidates taking first and

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second places respectively in the examinations on the subject. It is evident that Ryerson and the educational authorities planned to have the instruction given in country schools include the subject of Agriculture.

Moreover, two years before the establishment of the Normal School, in 1845, a text book on Agriculture was published for use in the schools of the Province. This was called *The Canadian Agricultural Reader*, and the title page reads:

THE
CANADIAN
AGRICULTURAL READER
designed principally
For the Use of Schools.

Compiled from the most Approved
and
Practical Authors
by a Vice-President
of the
Niagara District Agricultural Society
and
Township Superintendent of Common Schools.

Published by the Proprietors.
Niagara.
Printed by John Simpson.
1845.

In the preface to the book the author has this to say: "When the Spartan King was asked what things he thought most proper for boys to learn, his answer was 'Those things they expect to do when men'.

The principle involved in that wise answer has called forth this little work. The compiler has seen the youth of this country—seven-eighths of whom become in the course of time engaged in the noblest of mere earthly employments, the cultivation of the soil—pass through our schools without receiving the slightest instruction in that profession to which they hope to devote the remainder of their days."

It will thus be seen that seventy years ago the problem of having the rural school better serve the needs of rural life was recognized and an attempt made to remedy the defect. How far this book came unto use in the schools, the writer is unable to state.

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Why Attempts to Introduce Agriculture Failed

With these favorable conditions made for the introduction of the subject seventy years ago one naturally asks why in this year, 1915, the matter still remains as an educational problem in Ontario. Surely in that period of time, the subject should have become as fixed and acceptable as Arithmetic or History! The chief reason for its non-acceptance appears to be that there has never been any demand for it from farmers. There appears to have been little or no positive interest in it; if any interest at all, almost always antagonistic. Farmers have not believed in education for themselves as farmers. Education for people in the country has meant, and means yet largely to them, a schooling preparatory to employments apart from the farm. The burden of the manual part of the farming has obscured, and will continue to obscure for many, the advantages of a training of the youths' intelligence in terms of farm work and country life.

Ontario's experience in this is not unique, I believe. Throughout America in other Provinces and States the problem has been similar. The problem of securing the teaching of Agriculture resolves itself largely into country people *wanting it*. When farmers *want* Agriculture taught, it will not be difficult to find means to help the teachers to teach it.

Subsequent Efforts

Though these earliest attempts to secure a place for Agriculture in our schools were not successful, the matter has never been dropped by the Department of Education. Other schemes have been tried. We have had special text books prepared and authorized or prescribed for use in the schools. The first was by Ryerson, issued in 1870; the second by Mills and Shaw, issued in 1890; the last by James, issued in 1898. At one period when there seemed to be a more than usual interest in the project, special teacher-training classes were held at the Ontario Agricultural College, Guelph; this was in 1893 and 1894. In 1899 the subject was included amongst the obligatory subjects of Grades 7, 8 and 9 in rural schools and remained as such for a few years. About that time the world-wide agitation for the introduction of Nature-Study developed and with the introduction of that subject new plans and efforts came into operation.

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Relation of Present Schemes to the So-Called "MacDonald Movement"

The plans under which the subject is working its way at present into the schools are the outcome of the movement to introduce Nature-Study and School Gardening. At the commencement of the movement in Canada, about the year 1903, Sir William MacDonald of Montreal, acting through the Provincial Departments of Education, gave special grants of money to a few selected rural schools in each of the five eastern provinces to provide land and equipment for school gardening. Specially trained supervisors were also provided for the groups of schools in each province, and it was hoped that with these schools serving as object lessons the work would be copied extensively. In Ontario, the MacDonald school gardens, as they were called, were located at country schools in Carleton County within a radius of about twenty miles of the city of Ottawa. The results from these gardens, so far as influencing other schools, have been disappointingly meagre in this province, and I believe also in Quebec, New Brunswick, Nova Scotia and Prince Edward Island.

What was of more importance and effect than the commencement of a few school gardens, was Sir William MacDonald's establishment of the MacDonald Institute with a Nature-Study Department included, at the provincial Agricultural College at Guelph. This Department has linked together the Departments of Education and Agriculture in their efforts to better rural education. It has had charge of the special training of teachers in Agriculture for the Department of Education, and as a Department of the Agricultural College it has sought to help rural teachers by distributing planting material for garden work, by preparing bulletins, circulars and instruction sheets, by answering all inquiries for advice and help, by visiting schools to give lectures and by attending Teachers' and Trustees' Associations throughout the Province. Three years ago the head of the Nature-Study Department was appointed to the staff of the Department of Education as Director of Elementary Agricultural Education. Through this the Nature-Study Department virtually became a part of the provincial educational system.

Special Grants to Teachers and Trustees

The giving of financial help from the MacDonald funds to schools establishing school gardens was carried out only for a few

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years. It has been continued, however, by the Department of Education with modifications of the amounts and requirements to be fulfilled. At present any rural or village elementary school in the Province may undertake to qualify for the special grants allowed. Larger grants are allowed where the teacher giving the instruction is the holder of the *Elementary Certificate in Agriculture and Horticulture* obtained by attending two summer sessions or a special spring course at the Agricultural College. When the instruction is based on Home Gardening work alone, the grants are not so large as when a School Garden furnishes the basis for the instruction. The grants to the teachers are equal to the grants paid to the trustees, but trustees receive only as much as they expend on the work up to a certain limit. The grants vary from $8.00 to both teacher and trustees, where the teacher is uncertificated in Agriculture and conducts supervised Home Gardens, to $30.00 for both teacher and trustee, where the teacher is certificated in Agriculture and carries out the work through a successful School Garden.

Grants for Teaching Agriculture

The grants are not paid merely for conducting school gardening either at the school or at the homes. The grants are paid for *teaching Agriculture*. While School Gardens have always been supposed theoretically to imply that agricultural instruction is given, as a matter of actual practice they may be and often are conducted merely as exercises in gardening. To direct the work pedagogically aright the earning of the grants has been since 1912 made dependent on the systematic *teaching of Agriculture* for at least one hour a week throughout the calendar year. During the past few years in which this requirement has been insisted upon, good progress has been made in securing the proper educational uses of School and Home Gardens.

Recent Advancement

The advancement made during the past twelve years has been encouraging. The list given below shows how the work is gradually extending, and this without making the subject in any sense an obligatory one. The increase is due largely to the increased enlightenment of the country people regarding the subject brought about by the intelligent enthusiasm of trained teachers and the increased attention to rural education as a factor in our

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rural problem, shown by governments and press. There is a long way to go before our six thousand rural schools are engaged in the work but the right methods having been found, and leadership having been established in a few hundred representative schools scattered throughout the province, a general acceptance of the work as a proper undertaking for our country schools cannot long be delayed. The numbers given in the list include only those schools which have formally undertaken to meet all the requirements laid down in order to earn the special grants. There are hundreds of other schools taking up some part of the work but not meeting the gardening requirements or the requirements of the indoor instruction, or not feeling sure about the acceptibility of their undertaking, do not formally notify the Department of Education of their intention to qualify for grants.

PROGRESS OF AGRICULTURAL TEACHING IN ONTARIO

Year	No. of Schools	Grants to Trustees	Grants to Teachers
1903	4	$400.00	.....
1904	8	450.00	.....
1905	5	140.00	.....
1906	8	290.00	.....
1907	2	40.00	.....
1908	14	680.00	$120.00
1909	16	560.00	150.00
1910	17	750.00	510.00
1911	33	1310.00	900.00
1912	101	1893.03	2203.00
1913	159	2889.27	3131.00
1914	278	returns not	made yet

—From *Agricultural Education Bulletin No. 10.*

Relation Between Nature Study and Agriculture

The course in elementary Agriculture and Horticulture is adapted from the Nature-Study course prescribed for Ontario schools. It is still a Nature-Study course but specifically *agriculturalized.* Our most successful teachers distinguish between the two in their teaching and timetables. Usually the Nature-Study so called is confined to observations on birds, flowers, trees, clouds, etc., and a short period will be taken each day to report on these, discuss them and make records. The Agriculture, however, is

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given one or two special and longer periods each week. In the summer, part of this time may be occupied in practical work in the garden, though most teachers report that outside of the planting period the children do most of their gardening at noon and recesses. At other times of the year in many schools the agricultural period is on Friday afternoons.

General Method of Teaching Elementary Agriculture

In general the method of teaching is the nature-study method. The topics selected for lessons are in accordance with the season and also with the interests and activities of the farming community surrounding the school. The object to be attained is not so much to disseminate knowledge of agricultural facts as to awaken interests in the common things of the farm and of farm life, to lead to inquiry and reading, to direct activities, to stir ambitions, to arouse a love of the country, to show the possibilities of agriculture for a happy, independent, useful life, to make hungry for more knowledge and further schooling, to use the agricultural environment and experiences of the country boy and girl as *raw material* for the best possible kind of instruction in all the other subjects taught in the school. It is putting the school in agriculture as much as putting agriculture in the school! It is educating country boys and girls in terms of country life and for country needs! It is discovering the country school for country people! It is helping country people to find a new meaning in education for themselves as farmers!

In one of the instruction sheets sent to teachers, the following directions are suggested for teaching Agriculture. They show the application of the Nature Study method to the lesson in Agriculture.

1. Have a definite place on the time table for the lesson; the first or last period of Friday afternoon is suggested as a suitable one.

2. Make it definitely known to the pupils a week before, if possible, the subject of the next Friday's lesson; write this announcement on the blackboard.

3. Let the lessons be in the nature of answers or solutions to simple *problems* or *tasks*, make it clear that something is to be done in order that something may become known.

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4. Use the agricultural experiences and discoveries in composition, dictation, literature, supplementary reading, arithmetic, geography and drawing.

5. Use all available outside help to encourage the children. Have friends of the school talk to the children on such topics as the settlement of the district, the farming in the pioneer days, how to improve the land, how to raise corn, how to handle a dairy herd, how to care for an orchard, etc.

6. Direct their reading to books, bulletins and agricultural papers so that their interest may be aroused in agricultural matters.

7. Have the children, in at least the senior classes, keep Agricultural Note Books, preferably of the loose-leaf kind, recording their lessons, garden experiments, and inserting government bulletins.

Report by Teachers on Instruction Given

The Department of Education requires teachers to send in a report in December showing what instruction has been given during the year, how it has been given and what garden work has been carried on. These reports are endorsed by the Inspectors, (i. e. Superintendents) and submitted to the Department, along with the trustees' statement of expenditures. Besides the general oversight of the Inspectors, for the past two years Field Agents in Agricultural Education have visited the schools during the summer and inspected the work. The Field Agents are young men who have had successful experience in teaching in rural schools and who are in attendance at the Agricultural College taking the B.S.A. course. Besides visiting schools in which Agriculture is being taught under the departmental regulations, they visit other schools, confer with school trustees, address Women's Institutes, and carry on a propaganda generally for agricultural education.

The form used for the teacher's report, altered to fit these pages, and with blank spaces omitted, is printed below. It will show more clearly than any description could the nature of the instruction and the methods followed in elementary agriculture in the schools of Ontario:

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THE DEPARTMENT OF EDUCATION OF ONTARIO

TEACHER'S REPORT

ON

INSTRUCTION GIVEN IN ELEMENTARY AGRICULTURE AND HORTICULTURE

Instructions:

(1) Teachers desiring help in any phase of the work should write the *Director of Elementary Agricultural Education, Department of Education, Toronto.*

(2) In accordance with the Regulations (see Circular 13) teachers are required to record weekly the work done in order to qualify for grants. Pupils also in the upper classes are to keep records of instruction received and work done; for this separate and uniform note books should be used.

(3) This report, endorsed by the teacher, is to be transmitted to the Department of Education through the local Inspector. Teachers should arrange to forward it to their Inspectors at the close of the school term before Christmas, along with the Trustees' statement of expenditure.

(4) The work herein suggested is based on the course outlined in Nature-Study. *It is not expected that all the work can be covered.* Teachers will use their own judgment in the choice of topics. The work should bear directly on local interests, and be of a practical character. At least one hour a week is to be given to the work.

(5) While the records must necessarily be brief, they must indicate clearly *what has been done* and *how it has been done*, e. g.: *April 10th—With Pupils' help, pruned old apple tree in school yard; all prepared for work by reading, enquiry and discussion. Pupils recorded work in "before and after" drawings.*

(6) Most of the work of instruction must be of necessity with the pupils in the highest classes. It is to be practical as far as possible; merely talking and reading about topics will not answer; observation, investigation and experimenting by the pupils should form a basis for lessons. The work is to be *Agricultural Nature-Study!*

(7) Teachers are recommended to keep a duplicate of this Report for their own or others' guidance in future years. Extra forms may be had on application to the Director.

(8) To prevent delays, misunderstanding or mistakes regarding grants, teachers leaving in June should take care to leave their records complete, properly endorsed and in safe hands, also to show their new addresses.

Here follows spaces for name of School, County, Inspector, Teacher, when Certificate in Agriculture was obtained, and P. O. Address.

THE YEARLY PROGRAM

JANUARY

Plant Studies—Investigation of district's forest-tree areas with maps and census—Trees represented in fire wood and sawlogs—Arithmetic problems

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on lumber, sawlogs and woodpiles—Plans for conserving local forests, reforesting waste lands for establishing school arboretum—Value of ashes and saving of same for garden.

Animal Studies—Breeds of farm animals with local surveys and references.

Pupils' Progress Clubs—Organization for boys' work in poultry improvement (Poultry Club); and seed improvement (Corn, Oat, Barley, or Potato Clubs), and for girls work in home-cooking or sewing, growing and canning tomatoes or cultivating flowers (Tomato or Flower Clubs); winter reading in connection with these.

Physical Science—Practical lessons on air and liquid pressures—Common pump, barometer, lactometer.

FEBRUARY

Plant Studies—1. Germination tests of seed to be sown on local farms—Structure of little plants—Effects of light, heat and moisture on growth. 2. Study of apple or other fruit tree twigs to learn age, markings, fruit and leaf buds, etc.

Farm Crops—Study of structure of head of wheat and wheat grain—Comparison with oats, barley, corn—The legumes and their tubercles.

Milk Studies—Determination of specific gravity—Estimation of fat with Babcock Test—Pupils' cow testing work at home—Cow Testing Associations under Department of Agriculture, Ottawa.

Physical Science—Simple applications of electricity and steam.

MARCH

Plant Studies—Estimation of weed-seed impurities in seed to be sown locally; testing seed for germibility—Grading of seed samples under the Seed Control Act.

Farm Work—Maps of home farms showing the proposed plans of cropping—Rotations—Systems of farming.

Garden Work—Commencing seeds in boxes in windows or hot bed—Preparing stakes, labels, tools, window boxes, hanging baskets—Purchasing seeds, fertilizers, etc—Settling plans for garden experiments.

Soil Studies—A simple analysis—Classification of samples of soils—Water holding capacities—Effect of lime on clay—Soil maps of pupils' home farms—Local drainage schemes and possibilities.

APRIL

Plant Studies—Grafting and pruning—Practice on neglected trees—How to restore an old orchard.

Farm, Garden and Orchard Work—Implements used in spring work—Their principles of construction—How and why used—Spraying outfits—Preparation and use of fungicides and insecticides.

Farm Arithmetic—Problems based on actual local operations—Cost of plowing, harrowing, seeding, rolling, cultivating, building fences, silos, sheds, barns, etc.

Garden Work (for April or May)—Preparing the ground, laying out plots, planting.

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MAY

Plant Studies—Identification of weed seedlings in garden—Study of fruit blossoms and formation of fruit—Practice in proper method of planting fruit or shade trees.

Arbor Day—Organization for school ground improvement—Local bee to clean, level, plant trees and shrubbery, mend fences and outbuildings, prepare garden, improve road in front of school—Sports and social.

Animal Studies—Earthworm, bee, toad, beneficial birds, particularly in relation to agriculture.

Garden Work—Class instruction and exercises in thinning, mulching and weeding—Studies of seedlings' development—Setting out of window boxes and hanging baskets.

Here follows blanks for:

Plan of School Garden—Showing location with respect to school—Flower beds—Experiments and demonstrations—Vines and shrubbery planted—School ground improvement undertaken. The results of experiments might be stated here briefly.

Pupils' Home Projects—Work undertaken by School Progress Club or pupils at home—Plans for supervising—How supervised. Results of experiments—The results of experiments might be stated here briefly.

JUNE

Plant Studies—Studies of flower structures such as corn, wheat, potato, tomato—Spraying for plant diseases.

Road Improvement—Principles of good road making—An ideal country road—Improvement of road in front of school.

Class Excursion—Directed excursion to Agricultural College or other Experimental Farm for older pupils.

Insect Studies—Work of common injurious insects such as cutworms, codling moth, oyster shell bark louse, cabbage butterfly, and remedies.

Garden Work—Leaving all garden work in good shape—Definite arrangements for the care and protection of the garden during holidays, for observations and necessary harvesting.

Here follows space for notes on the Summer Holidays indicating how the garden was cared for and what work was done, also condition at school opening.

SEPTEMBER

Plant Studies—1. Weed study excursion—Preparation of mounted collections—Seed collections—Identification tests—Methods of eradictiaon. 2. Pupils' selection of corn in standing crop for seed and exhibition.

School Fair—Display of Progress Club's products (home made articles, poultry, potatoes, oat sheaves, etc., by boys, and sewing, cooking and canning by girls), garden produce, collections, demonstration of experiment carried out at school—Judging and awarding of prizes of books, bulbs, etc.

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Insect Studies—The housefly, its structure, habits, life history and suppression—Estimation of damage by codling moth.

Reading—Selection and purchase of agricultural books for school and home libraries.

OCTOBER

Plant Studies—1. Collections of apples and other fruits for competition and judging—Talk by local fruit grower—Testing pupils' ability to recognize varieties—Methods of packing and shipping.

2. Collections of injured or imperfect fruit—Causes and remedies.

Farm and Orchard Work—1. Threshing—Storage of crops—Model Barns—Silos—Estimates of yields—Determination of weights of bushels of grain.

2. Fall preparation of soil—Implements used and problems on cost of plowing, etc.

3. Fall pruning—Practice on neglected trees—Cover crops.

Garden Work—Taking cuttings and plants from garden for school or home windows or wintering over—Planting bulbs in school border or forcing for winter bloom—Fall preparation of school garden, cleaning, manuring and plowing.

NOVEMBER

Corn Fair—Collections of selected corn for competition—Judging competitions—Reading prize essays.

Farm Work—Wintering the farm animals—Good stabling and up-to-date appliances—Feeding—Care of poultry—Best hen houses.

Reading—Class debates, discussions on agricultural topics.

Physical Science—Simple experiments on air.

DECEMBER

Animal Studies—Breeds of farm poultry—Visits to poultry or live stock shows—Survey and census of local poultry industry—Marketing poultry.

Reading—Reviews of subjects read up by pupils in books, papers or bulletins.

Physical Science—Practical exercises with thermometers—Use of dairy thermometer—Weather records.

TEACHERS' REMARKS

(1) *Re Value of Work*—Has the work in agriculture had any effects on (a) other school work; (b) on the spirit of the school; (c) on the attendance; (d)on the attitude of the rate payers towards the school and education generally; (e) on directing pupils to the Agricultural College or to agricultural short courses?

(2) *Re Difficulties*—(1) What difficulties were encountered in the instructional side of the work, and how did you meet them? (2) Also regarding the practical side of the work in the gardening? (3) If there was difficulty from indifference or antagonism in the community, how did you succeed in meeting this?

(3) *Re Improvements*—Can you offer any suggestions for making the work more acceptable or more effective?

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(4) *Re Supervision of Home Gardens*—(1) What plan of supervision did you carry out? (2) What effects were observed on the work of the pupils and the interest of the parents?

Then follows space for the Teacher's Endorsement, to the following statement:

I hereby certify that I have carried out to the best of my ability the instruction in agriculture as required under the regulations set forth in Circular 13 and that the above is a true statement of work done in this school.

Some Common Mosses II

THE HAIR-CAPS

A. J. GROUT

To select from several hundred species of mosses found in the Eastern United States those that are most interesting and most likely to be met with by the greatest number of people, is something of a task. The Hair-caps (*Polytrichaceæ*) are chosen because they are our largest species, and are very common where there is moisture enough for ordinary vegetation.

The Hair-caps are so called because the calyptra is covered with a dense felt of fine hairs that nearly or quite covers the neiter

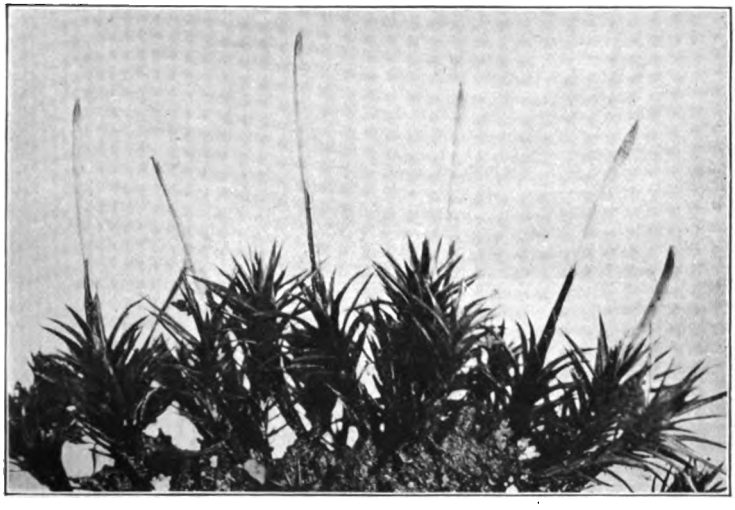

FIG. 1. Polytrichum piliferum ×5, young sporophytes.

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capsule at maturity. The mosses of this group all grow upon the ground, have strong wiry stems and a dark green color except at the young and growing tips. Examined with the lens or the microscope the peristome is found to be composed of a row of 32 or 64

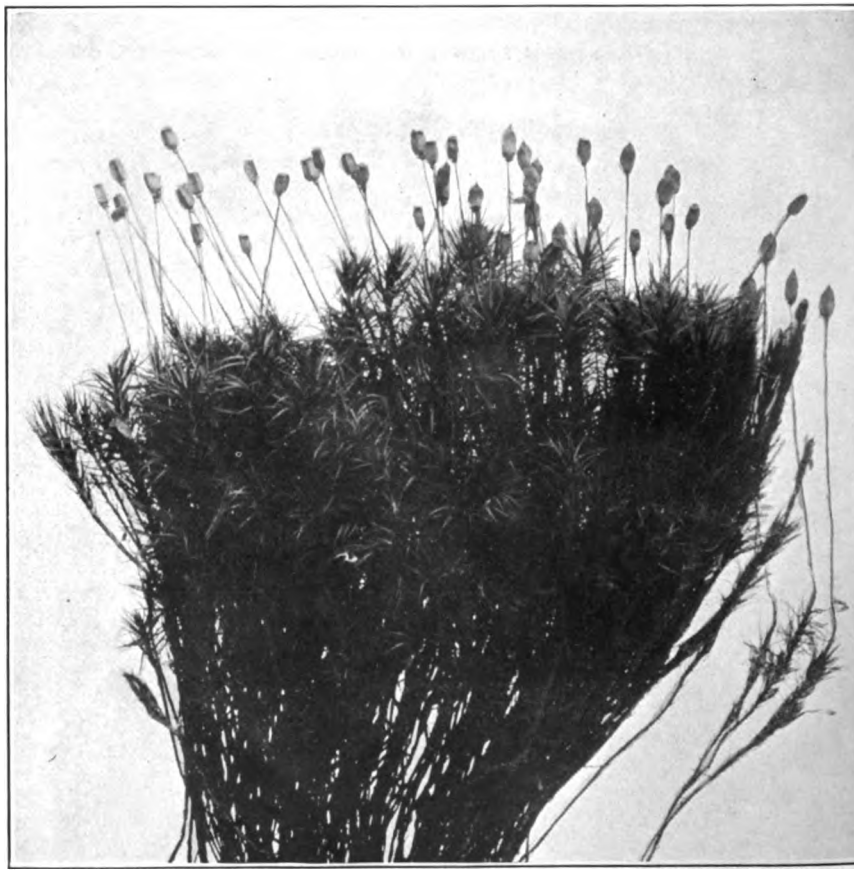

FIG. 2. P. commune ×1.

very short teeth attached by their tips to a membrane, the epiphragm, which resembles a tiny drumhead stretched across the mouth of the capsule. The leaves are long and narrow as a rule, sheathing at the base in the species we shall discuss, with a very broad strong costa, which bears on its upper surface thin plates of cells set edgewise to the surface of the leaf (technically called

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lamellæ). One genus of the family, (*Catharinea*), has leaves which become curled and crisped when dry, besides the calyptra is almost bald, this genus we shall barely mention.

The rest of our members of this family are divided into two genera, one *Pogonatum*, with the capsules cylindric and the other, *Polytrichum*, with the capsules prismatic, usually four angled and often almost cubical. In April the young sporophytes, which will later develop the capsules, appear as hairy-tipped lances as shown in the photograph. In June and July the capsules will become full grown and the different species can easily be recognized.

We have four common species of *Polytrichium*, *P. commune*, *P. Ohioense*, *P. juniperinum*, and *P. proliferum*. These are easily

FIG. 3. Capsules of P. ohioense ×2.

separated into two groups by the leaf-margins. The two species named first have the leaf margins nearly plane and strongly serrate. The teeth at the edges of the leaves are easily seen with a lens if the leaves are moist. When dry the edges of the leaves curl in and the leaves all fold up against the stem to prevent too great drying out of the plant's tissues.

The two last mentioned have the margins of the leaves thin and membranous and closely infolded like the hem of a garment or sheet.

P. commune, the Common Hair-cap, often called Bird Wheat or Robin's Wheat, is found everywhere in open fields among the grass and in open woods. The capsules are nearly cubical and the calyptra comes to or below the base of the capsule. *P. Ohioense* is more frequently found in the woods, the capsules are much longer than broad and are not entirely covered by the calyptra. *P. piliferum* is so called because the leaves bear at their apexes tiny

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white hairs or awns. The plants are small and grow in dry places, around ledges and on dry knolls. In the East it is common at low altitudes and in Colorado it is common almost to the summit of the continental divide up to 10,000 feet. *P. juniperinum* is rather lighter green than the other species and has larger capsules than in *P. piliferum* and its leaves lack the white awn. It often grows around the more moist borders of patches of *piliferum* and intermingled with it. Although the Hair-caps are a pest in old grass land they with the lichens are valuable soil formers for forest growth.

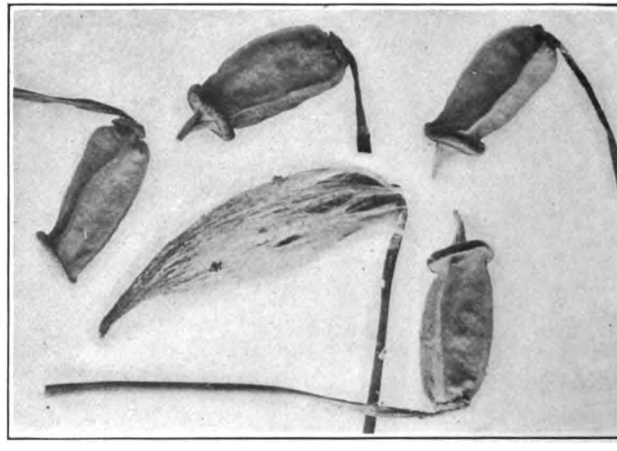

FIG. 4. Capsules of P. piliferum ×5.

It is very interesting to take a fully ripe and dry capsule of one of the Hair-caps and after removing the lid by gently poking it with a pencil point or other similar implement, gently knock on the side of the capsule. The spores will rattle out in tiny clouds like microscopic pepper from a tiny pepperbox.

Besides the plants bearing capsules and the sterile plants one can easily find rather short plants ending in tiny rosette. These are so-called "male plants" which produce the tiny swimming antherozoids; these have to swim in rain or dew to the summit of the female stems and fertilize the egg cell produced there in order to produce any spores.

That they are ever able to do this seems a miracle. In some species at least fertilization takes place in the early spring when everything is moistened with the melting snow.

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Use of Nature-Study for Cutting Material for Primary and Intermediate Grades

RUTH UPHAM
Supervisor of Drawing, East Aurora, Illinois

Although Nature-Study has always furnished a large part of the material for cutting lessons, they are usually not closely enough related to be of any special value to each other.

In the Nature-Study lesson the child gains a clear mental image of the object and in the Cutting Lesson that image is made permanent.

Suppose the child tries to make a cutting of a frog. He thinks that he knows exactly how a frog looks but after a few attempts he decides to study it more closely. By the time a satisfactory cutting from memory is made a good many definite facts about the

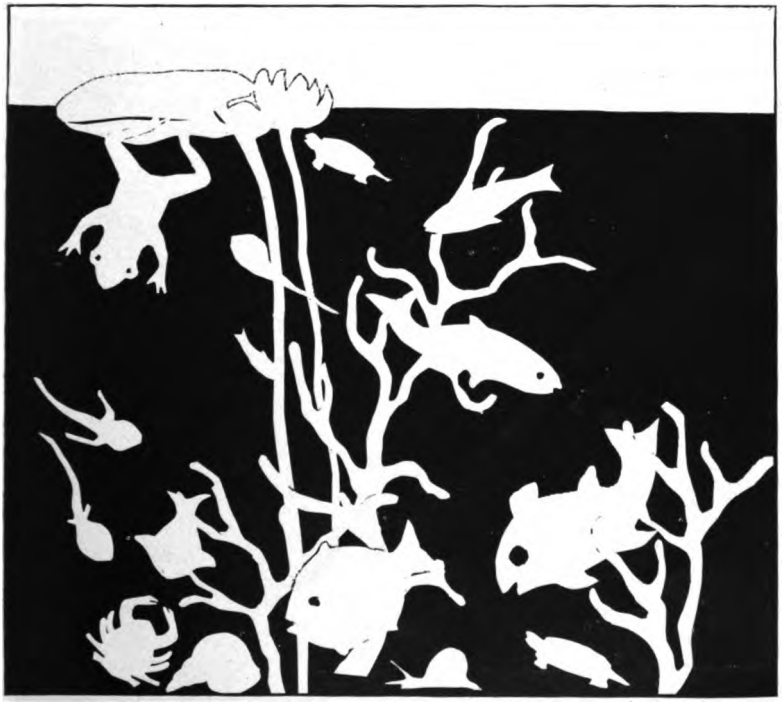

FIG. 1

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FIG. 2.

shape of the body, proportion of the different parts and the location of the joints are fixed in the memory.

One way of preserving the best cuttings is to mount them on a large sheet of paper thus making a class problem.

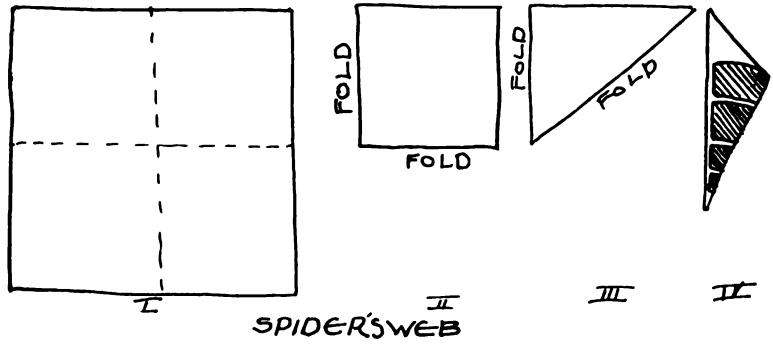

FIG. 3.

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FIG. 4.

FIG. 5.

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The first illustration represents the result of a series of lessons on animals that live in the water. Take a sheet of black cover paper

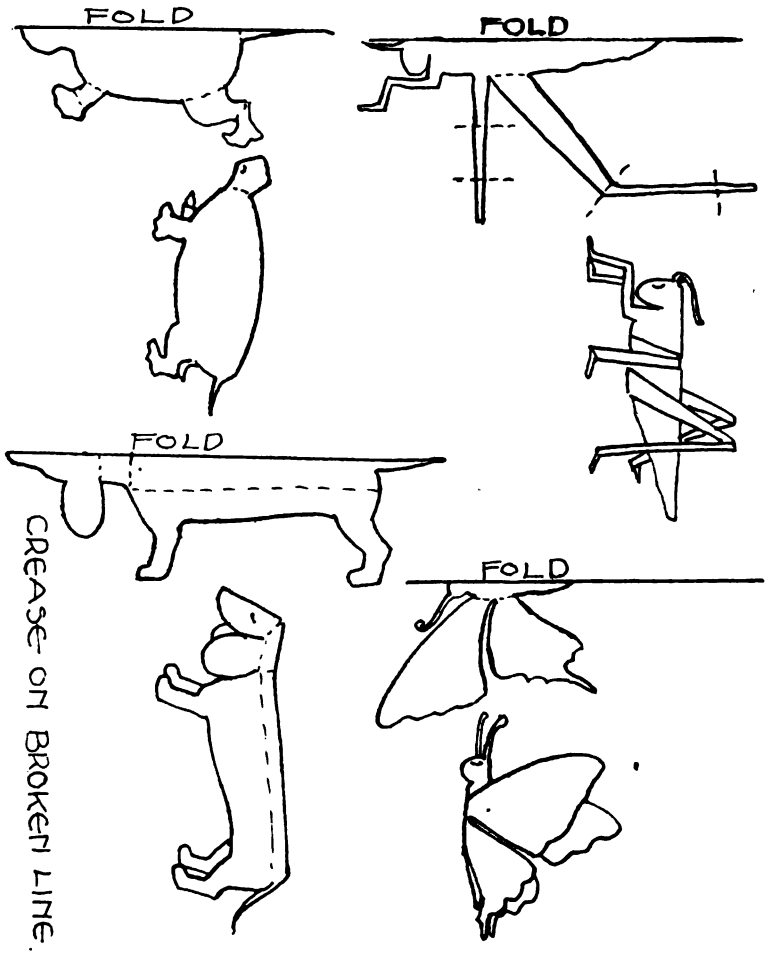

FIG. 6.

about twenty-four by twenty-seven inches. On it paste the cuttings in such a way that it gives unity and rhythm to the whole.

The poster illustrating insect life is made in the same way. The spider's web is made by folding and cutting a square of tissue paper as shown in illustration.

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The sheep poster is a suggestion of what can be done when studying animals. The skillful children may cut the driver and trees while every one in the room makes a sheep or lamb to add to the flock.

The fifth picture illustrated the few facts about the Stars that are studied in the lower grades.

The last illustration shows the method of cutting animals that stand.

They not only serve as toys but they can be used in connection with the sand table. The cuttings should be made from a pattern drawn on the board, until they can be cut from memory. The directions to the pupils are as follows: Take a piece of bogus or other heavy paper. Fold and hold in left hand with fold at the left. Start cutting on the fold at the lower edge of the paper. Unfold crease on the broken lines.

A pattern of any animal can be easily worked out if you have a picture showing the side view. The turkey, rabbit and duck are adapted to primary work.

Drawing and Nature-Study

GRACE SPALDING

There are shown in the figures below some drawings and compositions of animals that are the results of three drawing lessons by elementary students. The value of concentrated observation is shown in the papers which are covered with quick sketches of parts of the hens and rabbits, etc. (Fig. 1). As the animals were moving about while being drawn, the students were encouraged to get line of action of head, feet, body, etc., as well as proportion and shape of mass. The sketches of the entire animal (Fig. 2) were done from memory and illustrate the almost accurate knowledge gained by *drawing*, or recording the instant results of observation, it being not so much a matter of drawing quickly as of seeing quickly or at a glance. Whether the first two lessons were drawing or Nature-Study lessons it would be hard to say. For the teacher it certainly was a lesson in Nature-Study, at least as far as the chickens were concerned, as the following incident shows. I had directed the class of twenty-five students to go to the chicken yard

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of Dr. F— for their first study of the fowls uninstructed. When these sketches were brought in and the memory drawings made, I found that the chickens could *all* be criticized for short tails, stubby bills, small heads, etc. In fact, there were *no* drawings showing what we would recognize as a good looking hen or rooster. There being a similarity in the papers of the class, I went at once

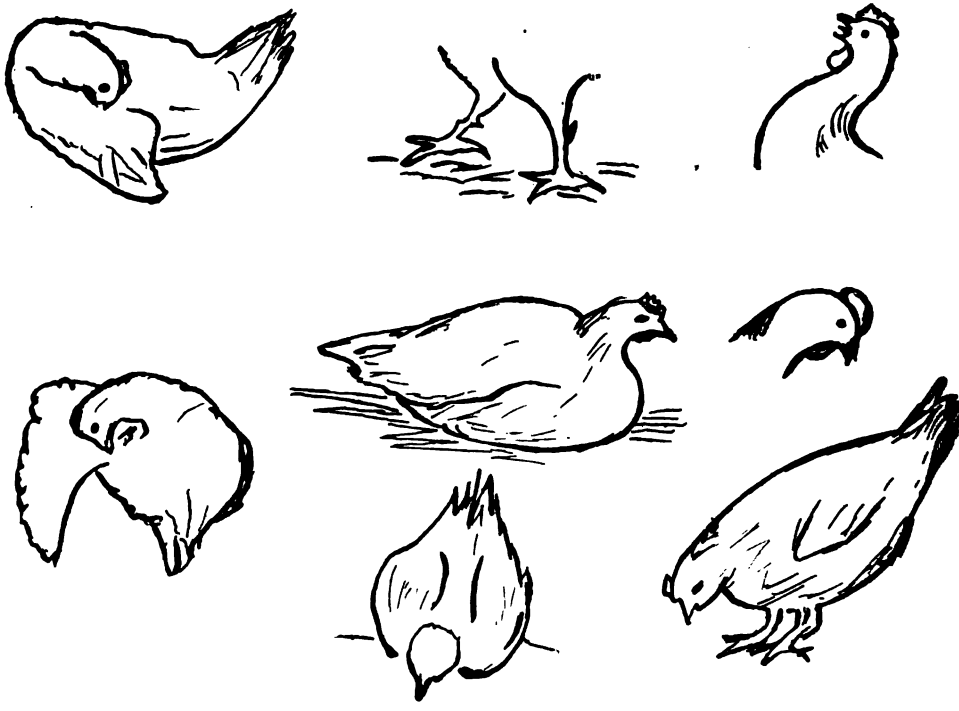

FIG. 1.

to Dr. F—'s fowls with a critical eye and I must confess that I discovered at once that there were chickens and *chickens* as varied in character as humans. We had a good laugh over our homely models and after school we went around the neighborhood inspecting different broods and making a selection of good models for study.

The next problem was a series of sketches showing a hen feeding, sitting, walking, running, etc., and the students were surprised at their own ability to work these problems out from the knowledge they had gained of balance of parts, proportion of body, etc.

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Selecting the best sketches, these were used as elements of composition, which called for study of relation in size with other objects, in value, and color, with results most interesting to the class as a whole.

The class which studied rabbits, proceeded in a similar manner, first an hour's sketching of the moving rabbits as they ate, jumped and played with each other (Fig. 3). One student was so interested in the movements that her paper was covered with funny little

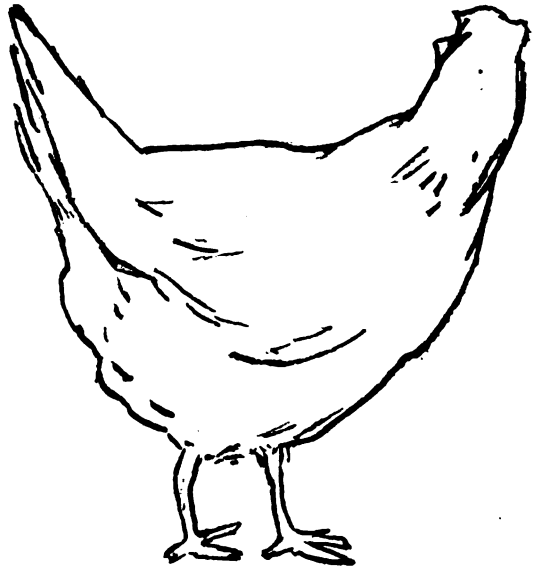

FIG. 2.

marks suggesting nothing at all. Yet when the time came for memory drawing, she had an animal complete in all its parts, in good proportion and most difficult action. After the memory drawing I asked students to go to the board to draw a rabbit standing erect, one walking with a cane, one sitting in an arm-chair with legs crossed, one running on all fours and one running erect in coat and knickerbockers with a hat on! Here was a test of what had been gained by alert observation. The shortness of front legs, the sharp heel, delicacy of paws, the long facile sweep of hind leg as it pushes forward, correct position of ears on the head, characteristic nose and cheek in profile, all that was most "rabbity" in a rabbit brought out distinctly.

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After this the class made original illustrations of a paragraph from Alice in Wonderland. The favorite passage being that in

FIG. 3.

which the white rabbit is hurrying down the corridor. One student who had had great difficulty with the hind legs was clever enough to put long trousers on the white rabbit and thus cover her own, if not the rabbits' deficiencies. At another time we used

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Uncle Rennus' stories of Brer Rabbit for illustrative study, getting much enjoyment and thereby much better work in an original, from students who have claimed no originality. These lessons accomplished much. Not only as drawing lessons, but in alertness of eye and mind. The many students who think drawing requires talent and should be studied only by those who possess it are finding their mistake. Drawing does not require talent, it does require *careful* observation and thought, and the practice which any ability demands.

General Science, Nature-Study, and Biology

MAURICE A. BIGELOW
Teachers College, Columbia University

(Read at the Philadelphia meeting of the American Nature-Study Society, December, 1914.)

"General Science" is an unfortunate name that in the past few years has been applied to certain general studies of nature that have been on trial in the last year of some elementary schools and in the first year of many four-year high schools. I have deliberately characterized the name as "unfortunate" because I have for years believed that all studies of nature preliminary to the organized sciences should be from the nature-study point of view, that is, they should deal with nature as it concerns our everyday life directly and not at all indirectly through the principles of formal science. Hence, it seems to me unfortunate that the naming and the organizing of this new study, which stands between nature-study and the high-school sciences, did not happen to be the work of educators who understood thoroughly the nature-study point of view. I am sure that such persons would have called the new subject of study not "general science" but "introduction to science," for they would have realized that it should be planned as a transition from nature-study into real science and not as an abstract of the formal sciences. The major part of the subject-matter thus far arranged for the new course of study is science, and far from the nature study point of view. Some of the books now in use might have been made from a few standard science books by the use of scissors, paste and patience, for they are only scrap-books of science. I find in them the atoms and molecules of chemistry, the conservation of energy and laws of motion of physics, the doctrine of evolution and the cell-protoplasmic theories of

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biology, and numerous minor generalizations of the sciences as commonly taught to college students. Such abstracts from organized sciences may be reasonable in "general science," but they afford no transition from nature-study and would be illogical in a course called "introduction to science."

However, I shall not quarrel longer with the name "general science," but for my present purposes accept it as one of the etymological absurdities of science and education. We biologists who are accustomed to such standardized misnomers as "cell," "guinea pig," and even "biology" itself should be perfectly willing to take a given name and make its definition fit our present conceptions. This is what I shall do with the term "general science" as I use it in this paper; and just as a biologist declares that a "cell" is not a cell to all the world outside the biological limits, so I am led to say that "general science" should be other than *science* in its strict meaning, and should be defined and developed as *introduction to science*, that is, as a transition from nature-study to formal science. Perhaps "general science" may some day develop to fit such a definition; but I doubt because the very name is misleading.

The position of "general science" in the public-school curriculum is important for both nature-study and biology. At present it is chiefly a subject for the first year of the four-year high schools; but there are several reasons why it should be pushed back one or two years. Most important of these is the need of beginning science studies earlier than at present. In other subjects, notably languages and mathematics, the pupils are in any given year of the high school much more advanced than in natural science, and so simply because they usually begin science in the high school with, at best, an inadequate amount of very elementary nature-study in the first five or six grades. Now, experience of competent teachers has shown that a good course of introduction to science may be begun in the seventh year, following nature-study in the sixth; and if such an introduction were assigned to both seventh and eighth grades, it would be possible to clear the way for a satisfactory course of biology or of the most approved kind of geography in the first year of four-year high schools. Without such an introduction to science in the last grammar grades, the first high school year of biology, as now given in many schools, is scarcely recognized by college experts in that science, because it is such a strange hy-

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brid of much nature-study, some elementary physics and chemistry, some real biology, some hygiene, and the required temperance instruction. The nature-study part of the high school biology (such as learning the names, habits, economics, and other interesting facts concerning common animals and plants) can be taught by good teachers in the fifth to seventh grades, the elements of physical science needed for biology could be taught well in the seventh or eighth grades, and all the hygiene which is not directly based on bacteriological and physiological facts could be taught in any grammar grades as part of introduction to science. The "temperance instruction" required in some leading States can not now be eliminated from the first high-school year by any organization of preceding science work, for the laws definitely prescribe for this year twenty pages in a text-book. However, this can be arranged so as not seriously to break the continuity of the first-year biology; and therefore I believe that we could approach the ideal arrangement of science studies if the biology in first year of high school could be preceded by one or preferably two years of well organized introduction to science in years corresponding to the last grammar grades.

Of course, this ideal arrangement of introduction to science with reference to nature-study on the one hand and biology on the other can not now be put into general practice, and, therefore, we must consider how biology after the first year of high school can be adjusted to general science in the first year. As I see it, the chief changes in the biology would be in the following lines: (1) introduction to science taught before or in the first year of high school would give the foundation in physical science for which in many schools one or more weeks of the first year course called "biology" is now commonly devoted; (2) such introduction to science should (but usually does not now) give the essential general hygiene that does not require a background of physiological or bacteriological knowledge; (3) introduction to science should attempt, for the present, to present some selected nature-study for the pupils who have been so unfortunate as to pass through eight grades without good teaching in that subject. Such introduction to science in or before the first year of our four year high schools would not only be a valuable study in itself, but also would make an almost ideal introduction to a course of biological science for the first or second year of high schools. Under present conditions, it seems wisest

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to develop introduction to science in the first year of most four year high schools and this means biology in the second year. To avoid misunderstanding, let me digress to say that this is not opposed to the New York plan of "first year biology," for the outline of that course as interpreted by leading teachers is, to my mind, a first class introduction to science with a biological center, and adapted to very peculiar local conditions.

All the present planning with reference to placing introduction to science in the first year of four year high schools offers only a more or less temporary compromise pending the development of the seventh and eighth grades under systems of junior high school, or departmental teaching, or any other plans which provide the special instructors and equipment that are absolutely essential for teaching the introduction to science. It is greatly to be desired that such opportunities for developing introduction to science may come quickly, for it is sure to be the medium for conveying valuable scientific information to the masses of young people who never enter the present high schools.

And now I ask attention to the nature-study point of view in the introduction to science that should follow nature-study in the elementary schools. I can make my point clearer if I give first an example of a lesson from the science point of view, and later follow with an outline of a series of lessons planned on a nature-study basis.

In a certain book that attempts to introduce grammar school children to science by imitating a course in physics, the first lesson on atoms and molecules runs essentially as follows:

Subject of lesson: "Matter, Masses, Molecules, Atoms, Spaces between Atoms." Exp. 1—Fill a tumbler with water and drop a stone into the water. Exp. 2—Lay a book on the table and try to put another book into the same space at the same time. "Definition—Matter is that which occupies space and two bodies of matter cannot occupy the same space at the same time." Exp. 3—Put powdered sugar into water. It disappears because the dissolved sugar consists of the smallest possible particles, called molecules. These are made up of atoms. Definitions of mass, molecule, atom. Exp. 4—Pour sand into a cup full of water. Why does the water run over? Exp. 5—Pour slowly some fine sugar into a cup full of water. Why does not the water run over as it did when sand was poured in? (The small sugar molecules fit in between those of

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water.) Exp. 6—Half fill a small bottle with water and then gently pour in alcohol until the bottle is full. Cork and shake. Why is the bottle not full after the water and alcohol are mixed? (Alcohol molecules occupy spaces between those of water.) "We may now understand that there are spaces between the molecules of all kinds of matter." [Here endeth the first lesson in this introduction to science by imitating fully-developed science.]

This is a clear case of introduction to science on the basis of organized science. It is starting the children at the high-water mark of nineteenth century science. I have selected, I admit, an extreme example of a science lesson; but the spirit of this lesson on atoms and molecules runs through most of the published books and outlines for courses in "general science." With few exceptions, they attempt to teach the principles of the several sciences dispensed in diluted doses adapted to young children. This tendency is marked even in certain books which contain excellent selections of practical facts of general interest. Thus in one of the most recent books we find in black headings such topics as the following: Molecular theory applied to air, heat and molecular movement, atomic theory, photosynthesis, potential and kinetic energy, and other such extracts from science text-books.

All such imitations of the standard science books are undesirable for introduction to science for several reasons: (1) they have little meaning to the pupils of the years for which "general science" is advocated; (2) they take time and attention from the simple practical problems that the regular science books have never treated adequately; (3) the fundamental principles of the sciences (e. g. atomic theory, molecular movement, evolution) are not necessary for teaching introduction to science; (4) it is desirable that introduction to science should be made quite unlike the formal sciences.

The last point deserves some amplification. There is doubtful value in copying from the regular science courses and there is a disadvantage in that brief attention to selected topics tends to give pupils the know-it-all attitude which will interfere with further study of sciences. If "general science" is to be a concentrated course that in one year makes high school courses of biology, geography, physics and chemistry unattractive, then its failure is devoutly to be wished by all who want more science in education. Perhaps all educators do not want more science, and it should be

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noted that general science is being favored by many school officials who have long stood for the minimum of science in our schools. If it is aimed to eliminate the regular sciences now in American high schools, there can be devised no better way than a course of "general science" which skims the cream from all the sciences and then serves it to the pupils as if it were the real substance of the sciences. We must not forget in our enthusiasm for "general science" that in spite of all the attractive superficialty of whipped cream, it is the rejected skimmed milk that contains the real food for growth. So it is with much of the valuable materials for scientific growth which we are now throwing aside in order to get the attractive cream for use in "general science." I hear some one say that the cream may be better than nothing for those who can not or will not take the whole milk and therefore "general science" that skims all science is good for those pupils who will not pass beyond the first years of high school. My answer is that the cream of science principles is indigestible and therefore undesirable for such pupils, and at the same time it prejudices the appetite of those who might otherwise make progress in regular science studies. Therefore, let us have introduction to science on a nature-study basis and not as the cream of science in general.

And now let us look at a plan for a series of lessons for introduction to science on the nature-study basis.

(1) Leading problem for consideration by the pupils: How is heat useful to us in everyday life? (Answers volunteered by a sixth grade class: cook our food, heat our buildings, make steam for power, make plants grow, keep our bodies warm, make light in lamps.)

(2) Second problem for pupils: How do we obtain heat for use? (Answers volunteered: burn fuels, heat from sun, friction on car wheels and Indian fire-making, heat when water is mixed with lime, from electricity in special stoves and heaters in street-cars.) Demonstrated experiments concerning the production of heat.

(3) Third problem: How is heat transferred? Simple experiments with wood, copper, iron, etc., as conductors. Study of heating systems of houses (hot air, hot water, steam). Some practical problems: Effect of hot water on thick and thin glassware. Why does metalware taken from hot water seem so much hotter than glass or crockery? Is metal best for dishes to keep

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foods warm? Should metal cups be used for drinking very hot beverages? Why are wooden and wire handles used on flat-irons, stove-pokers and lid-lifters? Is asbestos or zinc better for protecting wood against great heat? Materials used in coverings of steam-pipes. Hot-water bottles, vacuum bottles. Hot waterless bottles. Soap-stone foot-warmers and griddle-cake bakers (why is soap-stone better than iron for such purposes?) Use of the various kinds of materials for clothing in summer and winter. Experiments to illustrate principles involved in practical problems.

(4) Fourth problem: Heat of the human body—its origin and regulation. Its relation to health. Hygiene of clothing.

Along such lines in harmony with the spirit of nature-study the study of various large topics in the introduction to science should be developed. Its characteristic should be that it deals with nature as it is related to daily life and independently of the very technical side of organized science. Thus introduction to science will be both of advanced nature-study and a transition to real science.

In closing this paper I confess my faith in a coming course of introduction to science that is organized as education rather than as science and that prepares the way for, but does not displace, the regular sciences of our schools. Not until we get courses of introduction to science that follow the nature-study idea, the nature-study spirit or point of view, will we have a combination of introduction to science and the climax of nature-study in a form best adapted for popularization of elementary scientific studies.

Nature-Study and the Common Forms of Animal Life

Dr. R. W. SHUFELDT
Washington, D. C.

One of the most gratifying features of our American civilization at the present time is the widespread interest taken in the study of the many forms of life about us. This great group of living beings, or living things, is the subject material of the biological sciences, and commands the researches of the biologist. Grouped in its entirety, it is divisible into two main branches, namely Zoölogy and Botany, and the simple, primitive investigation of

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the forms of life constituting these two great departments is what we now term Nature-Study,—Nature in this sense being a word used to designate the crust of the Earth, as far as we may ever be able to examine it, as well as all forms of life—zoölogical and

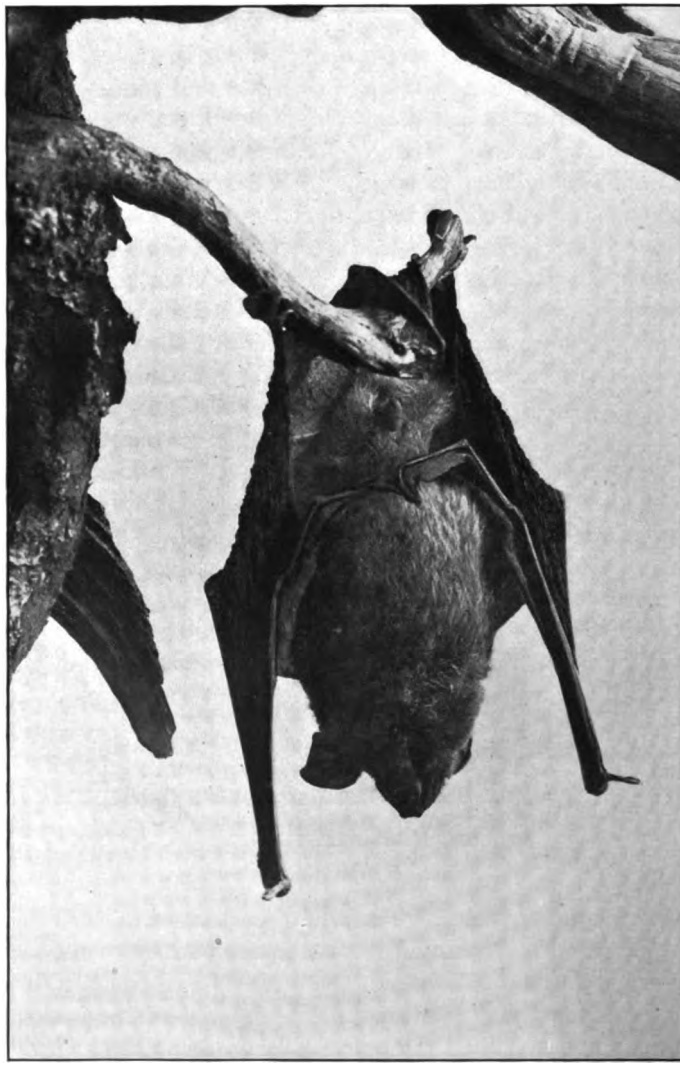

FIG. 1. The Common Dusky or Carolina Bat (*Eptesicus fuscus*), male. A bat of wide range throughout the United States.

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botanical—that live upon it. It is to the latter that the nature student usually devotes his or her attention, though at the same time we not infrequently meet with young students who find it more to their taste to confine themselves to the simpler studies in the various departments of geology, being often particularly interested in "fossils."

With respect to the study of plant and animal life, our juvenile scholars are encouraged to collect material for their studies; to make inquiry as to the habitats or ranges of such specimens as they may find; to gain, in the case of animal forms, some idea of the differences distinguishing the male from the female; to investigate habits and *behavior* as far as possible; reproduction or how the species is perpetuated in nature; its external form and internal structure; what all the *parts* are for or what they do for any particular creature,—that is, the laws of elementary physiology should be an important subject for the consideration of the young nature student.

Such studies have one great thing to recommend them: they train the mind and eye in that chief requisite to a successful life—the power of correct observation, and the consideration of cause and effect in the very material that goes to make up the world. There is no one thing so fatal to success as mal-observation.

If a boy or a girl is keen in the matter of being able to state correctly off-hand that such and such an animal is found here or there in nature and nowhere else, except through accident; that it has this or that habit, and behaves so and so under peculiar conditions; and can make correct statements upon all the other points set forth above—you may be very sure that such a youth will meet with success in almost any other line to which his or her mind and hands are directed and employed.

The study of nature and natural objects is no more mysterious and difficult of comprehension than it is to study and understand the mechanism of a watch, or the principles which govern the movements and action of the simple steam engine. In other words, as Professor Huxley long ago said: "Science is simply common sense at its best." That great mind of the Victorian Era further expressed himself in the following words which are dear to every nature lover, and fitly lead up to what I have to bring forward in this article: "When simple curiosity passes into the love of knowledge as such, and the gratification of the æsthetic

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sense of the beauty of completeness and accuracy seems more desirable than the easy indolence of ignorance; when the finding out of the causes of things becomes a source of joy, and he is counted happy who is successful in the search; common knowledge of nature passes into what our forefathers called Natural History, from whence there is but a step to that which used to be termed Natural Philosophy and now passes by the name of Physical Science.

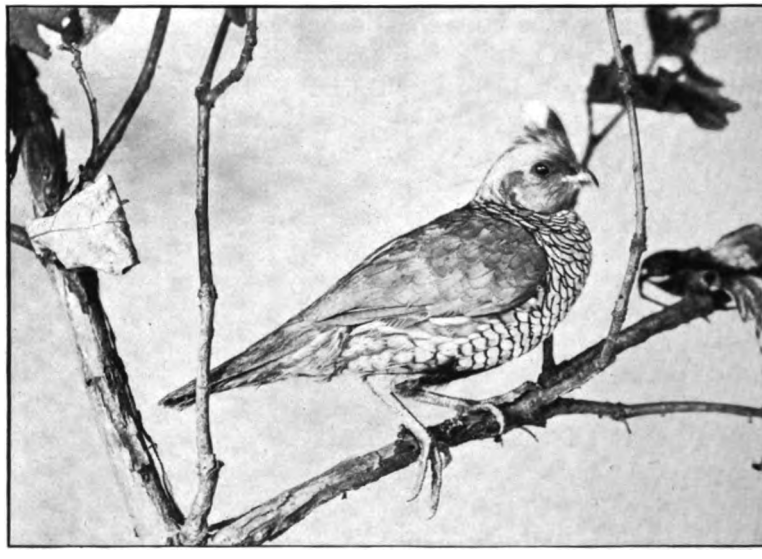

FIG. 2. Chestnut-bellied Scaled Partridge or "Quail" (*Callipepla squamata castanogastris*).

"In this final stage of knowledge, the phenomena of nature are regarded as one continuous series of causes and effects; and the ultimate object of science is to trace out that series, from the term which is nearest to us, to that which is at the furthest limit accessible to our means of investigation.

"The course of nature as it is, as it has been, and as it will be, is the object of scientific inquiry; whatever lies beyond, above, or below this is outside science. But the philosopher need not despair at the limitation of his field of labour: in relation to the human mind nature is boundless; and, though nowhere inaccessible, she is everywhere unfathomable."

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As I read the very instructive and beautiful number of THE NATURE-STUDY REVIEW for December, 1914 (Vol. 10, No. 9), my mind was carried back over the more than half century's study and observation of what Nature offers us in all parts of the world, and the thought came to me as to what, among other things, had been the source of the greatest assistance to me throughout this long term of continuous study. The answer was not far to seek, and I am convinced that there is no more efficient aid to the young student of nature than correct and life-like illustrations of the objects he reads about or sees in nature. Scientific literature would indeed, either for young or old students, be a dull story were it not for the great wealth of pictorial illustration that now forms a part of it. This feature has been immensely improved in all particulars, especially in the matter of accuracy and naturalness, through the achievements of modern photography in that direction. The appreciation of this fact and its utilization has long been seen as constituting a feature of our A. B. C. books and other juvenile literature. Our bird books for the young would surely be very insipid and tiresome were it not that the only ones deserving of the name are generously illustrated with fine colored figures of the birds they undertake to describe. All this applies especially to plants, flowers, fossils, insects, spiders, crayfish, shells, fishes, reptiles, and all the rest we find in nature, up to include the various races of men inhabiting the world. Good illustrations—photographic, if possible—are not only an inspiration to nature students at any age but they are absolutely essential.

For a great many years past, I have never allowed a year to go by that I did not make a more or fewer number of photographic negatives of the common plants and animals of the region where I happened to be living at the time. This collection has now gotten to be quite extensive, and, although some of my "animal and plant photographs" have been published, it would be very selfish on my part were I not to turn some of these into channels where our boys and girls could make use of them in their nature studies. As a rule, all of my subjects are of the size of nature, unless they be too large to get them conveniently on to a five by eight dry plate. Were the entire series I have in my collection published, with suitable and descriptive text, a very substantial contribution to the history of many American plants and animals would be the result. As it is, I only aim to give here, in the

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NATURE-STUDY REVIEW, from time to time, a few of the animal and plant forms studied by the large majority of our young nature

FIG. 3. Common Box Tortoise (*Cistudo carolina*), adult. The common land tortoise of eastern United States.

students, together with the common and scientific name of the plant or animal shown, with a brief account of its natural history. My hope is that, as the years go by, such illustrated contributions

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as these, as far as they are furnished by me, will, in time, constitute a series of pictorial aids to the field and school-room studies of the nature classes everywhere in this country.

Very few living bats have ever been photographed by me, and the only species with which I have been thoroughly successful is the common Dusky or Carolina Bat (*Eptesicus fuscus*). Of this widely distributed species in the United States I have made some eight or ten life size negatives, in various attitudes. One of the best of these is here reproduced in Figure 1. It shows a male individual suspended from the broken branch of an old tree. Its lower parts are toward the observer, and the curious way in which this very interesting little animal curls its tail over the limb is well seen. Bats of this species have a length of three or four inches, an extent of one foot, with a tail one and a half inches long. The fine fur is of an earth-brown color, and the tail (interfemoral) membrane is furred at the base only, while its wings are entirely naked.

I have made life photographs of nearly, if not of all, of our American quails. The one shown in Figure 2 is a beautiful example (male) of the Chestnut-bellied Scaled Quail or Partridge of the West. Note that it has black emarginations to all the feathers of the breast and under parts, in which latter locality a chestnut area is found—hence one of its names. This beautiful bird also has a soft, erectile crest, the central portion of which is white. Out West, many hunters call this the "Blue Quail." It is the *Callipepla squamata castanogastris* of science.

Most young students of our animals are familiar with the common Box Tortoise (*Cistudo carolina*) (*Terepene?*). This beautiful representative of the American chelonians is very abundant in some parts of Eastern United States, and it is remarkable for its great variation in colors and form. The specimen shown in Figure 3 was taken in northern Virginia, and is a very old individual. It lays white, ellipsoidal eggs, as do so many reptiles. I once published the photograph of the very young specimen of this species that had two heads; but then, two-headed specimens of many other kinds of animals are found to exist, and I have seen cases of it in snakes, lizards, fish, cats, dogs, antelope, ruffed grouse, cows, and even in our own species. Any vertebrate may furnish such examples. This box tortoise can draw itself entirely within its shell, closing up the same with the lids formed by the

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hinged *plastron*. We have also other turtles that can do this, but they are not marked like our box tortoise, and can not be easily confounded with it.

In the eastern United States we have two species of *spotted* frogs that are frequently confused by young naturalists. One is the Salt-marsh Frog (*Rana virescens*), here shown in Figure 4, and the other is the Leopard or Pickerel Frog (*Rana palustris*). One way to recognize the latter species is the regular arrangement

FIG. 4. Salt-marsh Frog (*Rana virescens*).

of the spotting on the back and sides, while in the Salt-marsh Frog the spots are paler and irregularly disposed. The prominent lines down the sides are simply raised, vein-like folds of skin, the purpose of which, beyond being ornamental, is not known. You will also meet with other kinds of frogs in the ponds of the Atlantic States, namely the Pond or Green Frog (*Rana clamata*); and the much larger Bull Frog (*Rana catesbiana*). The first named may be easily distinguished from the former by the conspicuous, raised skin-fold, beginning behind either eye and running down the side of the body. This anatomical character is not found in the Bull Frog.

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My collection of negatives contains examples of many insects and spiders, including beetles, grasshoppers, moths and butterflies of numerous species. A fine specimen of the Broad-necked Prionus (*Prionus laticollis*), which is a common, large, rather shiny, black beetle, with knobby antennæ and a broad thorax, which has jagged, free edges to it, is frequently found flying about the city street lights after dark.

We are all more or less familiar with the common grape-vine beetle or Spotted Pelidnota (*Pelidnota punctata*). In color, this handsome insect is of a pale mahogany-brown, with three small, round, black spots near the free edge of either wing cover. If you want specimens of this beetle for your collections, you must look for it along in July or in early August, either on the grape-vines at home or on the wild kind in the woods.

The Nature-Study Situation in the Elementary Schools of Illinois for 1914-1915

FLORENCE G. BILLIG

(An investigation made under the direction of Dr. Otis W. Caldwell of the School of Education, The University of Chicago.)

In order to determine the present situation of Nature-Study in the elementary schools of Illinois, a questionnaire was sent to the superintendent of schools in each city in Illinois with a population of three thousand or more, to the directors of the training schools of the five state normal schools, and to the principal of the elementary school of the School of Education, the University of Chicago. Ninety-nine replies were received from the one hundred seventeen letters sent.

The data from these replies are summed up in charts I and II. Chart I gives the results in numbers while chart II states the same facts in per cent form. The result shows eighty-three or 83.83 per cent. of the schools reporting do some work in Nature-Study. Of this number 59.03 per cent. are pursuing definitely organized courses: 6.02 per cent. of the schools not having definitely organized outlines are working on courses. Ten schools have supervisors who take charge of the Nature-Study work. In 59 per cent. of the schools, Nature-Study is taught throughout the year as against 10.8 per cent. teaching it only during the spring and

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fall months. On this question 30.2 per cent. made no reply. Fifty-one and eight-tenths per cent. report Nature-Study taught in each grade in the elementary school in contrast with 10.8 per cent. which limit the work to grades one to six, and 16.8 per cent. which carry the work only in the first four grades.

Little uniformity, was shown by the reports, in the amount of time given to the Nature-Study work. From fifteen to one hundred minutes a week are allowed. An average of fifty minutes a week is given to this work. This is broken into from two to five recitation periods.

Charts III and IV show the situation regarding the courses of study used. Forty-nine and eight-tenths per cent. of the schools are following their own individual outlines. The Illinois State course of study, the plan used by the elementary school of the School of Education, the University of Chicago, and the course made by Miss Jean Patterson of the Illinois State Normal University, Normal, Illinois seem to greatly influence the Nature-Study work throughout the state. From a careful examination of the courses, it is evident there is much uniformity. In the primary grades, the work is largely confined to identification of nature materials. In the intermediate grades, attention is turned to the life histories and habits of plants and animals. A somewhat different type of work is taken up in the grammar grades. The physical side of the work is brought out and the study of plants and animals from the economic point of view is emphasized. Much time is given to gardening and experimentation. Thirty-one and eight-tenths per cent. of the schools having organized courses in Nature-Study include Physiology as a part of the work. This is outlined for the winter months.

Charts V and VI show the amount of correlation of Nature-Study with other subjects. Thirty-one and thirty-three hundredths per cent. of the schools teach it in connection with other work.

From this study it can be concluded, in so far as the ninety-nine schools furnishing the data are representative of the work done in Illinois, that nature-study has a definite place in the curricula of the elementary schools of Illinois, that there is uniformity in the courses of study used, and that Physiology is considered a part of the Nature-Study course.

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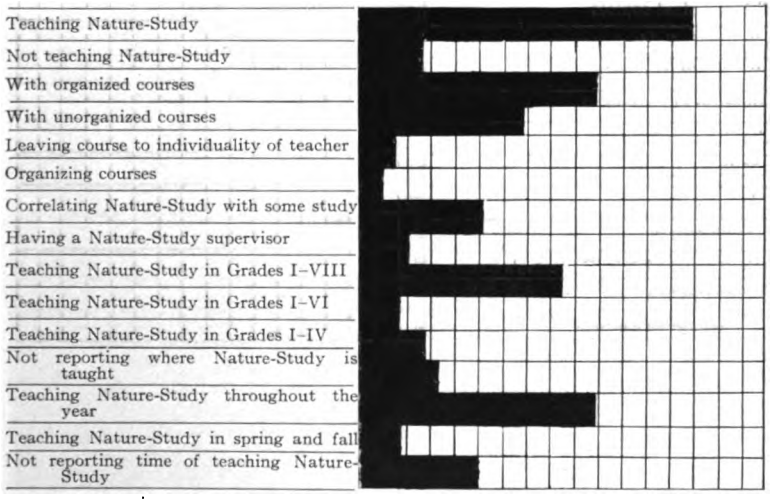
CHART I—The Nature-Study situation in Illinois; based on the data received from 99 schools.

	Number of Schools Reporting
Teaching Nature-Study	83
Not teaching Nature-Study	16
With organized courses	49
With unorganized courses	34
Leaving course to individuality of teacher	8
Organizing courses	5
Correlating Nature-Study with some study	26
Having a Nature-Study supervisor	10
Teaching Nature-Study in Grades I–VIII	43
Teaching Nature-Study in Grades I–VI	9
Teaching Nature-Study in Grades I–IV	14
Not reporting where Nature-Study is taught	17
Teaching Nature-Study throughout year	49
Teaching Nature-Study in spring and fall	9
Not reporting time of teaching Nature-Study	25

CHART II. Graphic chart of above data.


Teaching Nature-Study
Not teaching Nature-Study
With organized courses
With unorganized courses
Leaving course to individuality of teacher
Organizing courses
Correlating Nature-Study with some study
Having a Nature-Study supervisor
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Teaching Nature-Study in Grades I–IV
Not reporting where Nature-Study is taught
Teaching Nature-Study throughout the year
Teaching Nature-Study in spring and fall
Not reporting time of teaching Nature-Study

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CHART III—The courses of study used in the Nature-Study work in Illinois. Forty-nine of the 99 schools reporting follow their own individual courses.

	Number of Schools
Teaching Nature-Study	73
With unorganized courses	34
With organized courses	49
Following individual courses	23
Following State course	10
University of Chicago plan	4
Miss Patterson's course	3
DeKalb course	2
Chicago course	2
Macomb course	1
State course and Miss Patterson's course	1
State course and New York State syllabus	1
University of Chicago plan and Miss Patterson's course	1

CHART IV—Graphic chart of above data.

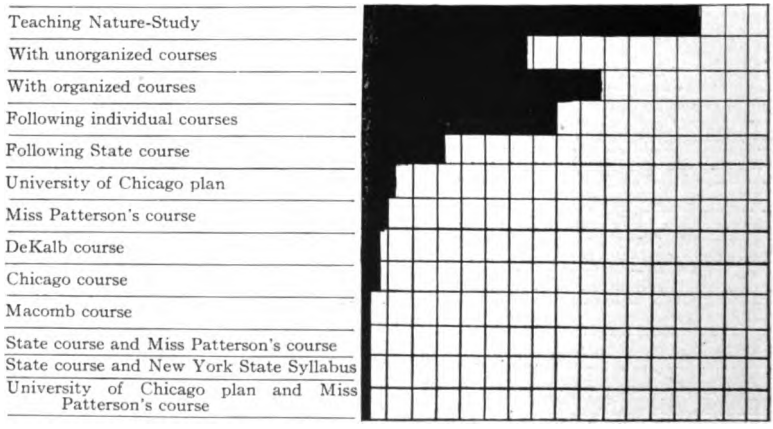

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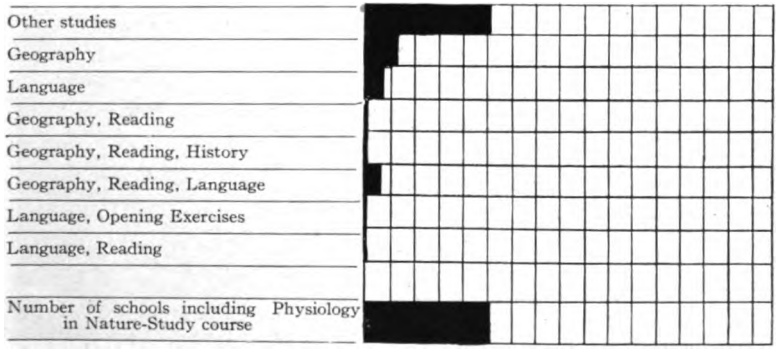
CHART V.—The extent to which Nature-Study is correlated with the other school subjects. Physiology is included as a part of the Nature-Study work in 26 of the schools reporting.

Number of Schools Correlating Nature-Study With:

Other studies	26
Geography	6
Language	4
Geography, Reading	1
Geography, Reading, History	1
Geography, Reading, Language	4
Language, Opening Exercises	1
Language, Reading	1
Number of schools including Physiology in Nature-Study course	26

CHART VI—Graphic representation of above data.



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Editorial

Education tends just now to deal with things, to handle the concrete. We make bread, build an arm chair, manipulate a typewriter, paint a wood shed, raise vegetables, breed chickens, shoe a horse, or grow a bumper crop of corn, all in the name of education. And we do these things not with ulterior motives apparently but to do them well. Nature-study is a part of this new movement in education toward the things of every day environment. It deals with objects, sees, handles, hears, tastes. All of which is good. Man's life is based on things. The material progress of the race is expressed in terms of man's conquest of, or better, his coöperation with the things about him. Primitive man struggling up from animalism used the club or smooth stone for weapon and became a hunter. He struck flint and his crude cave became a warm shelter. He accustomed the young goat to his presence and became a herder. He stirred the ground with fire-hardened stick and trained the beast to plow, becoming so a farmer. It behooves us all to respect the things on which we have risen, to maintain our dexterity. That person has lost a very fundamental joy who does not, with rare pleasure, hoe his garden, tend his chickens, make his furniture or perform some creative manual labor with satisfaction. And yet man's distinctive life is not in the world of things but in a world of ideas and ideals. Once he despairingly accepted the world and longed for a better one—his happy hunting ground, his heaven. Now he undertakes to help heaven appear on earth. He finds cacti with cruel thorns. He proceeds to grow thornless ones that serve his beast for food. He finds cattle that yield him a scant supply of milk. He proceeds to develop those that give an abundance for his need. He conceives an ideal wheat with sturdy stalks the wind may not break, with resistance to disease, one that matures early and mills well. He creates it to his liking. He finds home a cave, his mate his chattel, his children slaves. Slowly his ideals advance and he brings them slowly to pass, until home is sanctified, his wife his equal, his children free at least during their years of immaturity. And still the young see visions of a better social life.

Man, too, is a creator. Nature-study dares not stop with things. It must lead on into the realm of significant ideas and ideals. To sense things as they are is not enough. We must take them apart, disjoint them into their elements, let our imaginations play with

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the parts and reassemble them. There is a scientific use for the imagination. Out of it come the ideals of things as they ought to be—the motive power of man's creation.

The editor wishes to express his thanks to Mr. Gilbert H. Trafton of Mankato (Minn.) Normal School and to Mr. Ralph E. Wager of the DeKalb (Ill.) Normal for their care in editing the March and April numbers respectively.

Book Reviews

The Wonder of Life, J. Arthur Thomson, p. xxxi + 658. Henry Holt & Co. $3.50.

Professor Thomson is eminent as the Professor of Natural History in the University of Aberdeen and is one of the most fascinating of English writers on scientific topics. In his preface the author characterizes the book as "an unconventional introduction to Natural History" and expresses the hope "that it may be found useful in 'Nature-Study.'" The alternative chapter titles are the more suggestive: Chap. I, The Drama of Life; or Vital Motives; Chap. II, The Exploitation of the Earth; Chap. III, The Circumvention of Space and the Conquest of Time; Chap. IV, Modes of Animal Behavior; Chap. V, The Intricacy of Interrelations; Chap. VI, From Birth through Love to Death; Chap. VII, The Wonder of Life.

The book is very readable for it is full of recently discovered facts, carefully digested and stated so as to elucidate questions and suggest new problems. It is a new type of natural history, not conventionally arranged according to a stereotyped classification but on a basis of the ideas embodied in the chapter titles. It is the book of nature-study of the world. The material is drawn from all over the earth, suggestive facts, pertinent life histories, wonderful harmonies, given with the authority of an eminent critic. It will stimulate many to see the marvels of their own familiar environment and to see them in forms of some of Life's large problems.

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Plant Breeding, L. H. Bailey and Arthur W. Gilbert, p. xviii + 474. The Macmillan Co. $2.00.

Fundamentals of Plant Breeding, John M. Coulter. p. xiv + 347. D. Appleton & Co. $.

It is significant of the progress we are making in our control of nature to find such books as these bringing to the average intelligent farmer and to the college student the needful facts and processes in the development of desired new strains and types of plants. The subject matter of the two books is much the same. They start with a discussion of variation. (One chapter in Coulter, four in Bailey & Gilbert.) Then discuss Mutations, Hybridization, Heredity, Mass Culture, Pedigree Culture, The Work now being done in Plant Breeding. Bailey & Gilbert have an extensive bibliography and seventy pages of suggested field and laboratory exercises. Coulter has a chapter on Plant Reproduction, The Theory of Natural Selection, one on Plant Diseases and separate chapters on Mass and Pedigree Cultures. Bailey & Gilbert have four chapters on How Domestic Varieties Originate and on How to Cross Plants. In spite of the differences in chapter headings there are very few subjects treated in one not touched in the other.

Both books are written in a clear, interesting manner. As one would anticipate from an acquaintance with the other work of the authors, Coulter stresses the problem side of the questions and their bearing on scientific botany while Bailey & Gilbert emphasize the matter from the point of view of breeding as an art.

Researches on Irritability of Plants, by Jagadis Chunder Bose, xxiv + 376 pp., 190 figs. Longmans, Green & Co. 1913. $2.50.

The author of this book has been carrying on researches at the University of Calcutta respecting the irritability of plants. With marvelous patience and persistence he has carried on a remarkable series of investigations the details of which are too abstruse to report here. The work was carried on largely with plants that give a visible reaction to shock as the common sensitive plant. By the use of specially devised apparatus of great delicacy it was possible to secure records of the responses of the plants under a

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great variety of conditions. Professor Bose finds that plant cells are affected similarly to animal cells by temperature, light, chemical reagents including alcohol, fatigue, shock, and other conditions. His thesis is that "there is hardly any phenomenon of irritability observed in the animal which is not found in the plant" and that there is, therefore, a fundamental unity in plant and animal responses to stimulus.

Adventures Among Wild Flowers, by John Trevena. Longmans, Green & Co., New York. Edward Arnold, London. Pp. 304; sixteen inset photogravures. $2.00.

With the affection and color-sense of a Richard Jefferies and something of the humor of Charles Dudley Warner in his Summer in a Garden, John Trevena has recorded his observations of, and reflections upon, some of the interesting wild flowers and some of the equally interesting human examples that he has found in his rambles in England and Alpine Europe. He does not draw very fine distinctions between flowering specimens and human ones, so the reader must be on his guard to know when the she's and who's refer to gentianas and geraniums and when to Rosamonds and Romeos. At the outset, Trevena disavows the least desire to vivisect "the vile body" of a plant under suspicion of photosynthesis and osmotic pressure. He is far more interested in the history and moral character of wild flowers than in the adoration of their stamens, especially of the "glorious free plants of rocks and hills." These, to him, possess real character and sometimes possibly consciousness. On frosty nights he wonders whether they are suffering and it troubles him to see one of them dying. These phrases, for example, reflect his feelings towards one Alpine blossom—*Eritrichium nanum* of the botanist—"the votaress of the snows . . . with flowers of the morning sky and foliage of the evening cloud . . . God's blue flower. Search for her by all means, and good luck be with you, be not content until you have found her, but let it be your pleasure ever afterwards to remember that you never so much as injured a hair upon one of her woolly leaves." Our author is willing to prove that wild flower quest is perfect human sport; but to be perfect, he is careful to show that the quest must be pursued in the spirit of the benevolent emigra-

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tion agent. To scatter seeds and roots of wild flowers in congenial situations in the same spirit as one would scatter seeds of kindness is good nature-study doctrine. Emerson called him Friend who "loved the wood-rose and left it on its stalk" but Trevena goes further, for he finds it knightly service to seek and befriend the timid blossoms that are maintaining a losing struggle for their existence. It certainly is a form of sport that incurs neither death or pang or pain, to its subjects nor regret to its pursuer.

The Backwoodsman, Charles G. D. Roberts. 269 pp. Macmillan Co. 50c.

This is a collection of fifteen of Roberts' stories. The book is one of Macmillan's juvenile library so that many of the stories are those that would appeal to the boy. They are tales of adventure and heroism, several of them with a vein of fine sentiment. "The Gentling of Red McWha" is the story of a lumberman beneath whose rough exterior was a kindly man. The hero in him comes out in the rescue of a little girl who had been adopted by the camp. "The Grip in the Deep Hole" is a story of the unintentional rescue by a bear of the woodsman Barnes from a dangerous pool in which he has been caught. "Mrs. Gammit and the Porcupines" has a delicious bit of humor in it. Mrs. Gammit persists in the belief that the porcupines are robbing her chicken coop. She will not believe that it is the weasels, "those skinny little rats ain't wuth noticin'". These stories are hardly on a par with Roberts' best, and yet they are well worth reading. Any boy who has a fondness for the woods will enjoy them and they will help him not only to an appreciation of some of nature's secrets, but to a better understanding of some elements of the heroic.

Wanted

To complete volumes for binding, we wish to buy one copy each of the NATURE-STUDY REVIEW for October, 1913, September and October, 1914. Will pay 15 cents a copy. Mail flat to THE NATURE-STUDY REVIEW, Ithaca, New York.

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THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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VOL. 11 SEPTEMBER, 1915 No. 6

A Study of Spiders

ALICE JEAN PATTERSON

Spiders afford material for a most interesting series of nature study lessons. They may be studied either in spring or fall. The fall is perhaps preferable, since at this time a large number of different species of spiders are abundant everywhere.

The work may well begin early in September. Like many other nature study topics, the most satisfactory results may be gained if the observations and study extend over a period of several weeks. This does not mean that there must be lessons every day during this time, but rather that the children may be given time to carry on their investigations and discoveries, with an occasional lesson for reports, discussions and questions.

I have found the plan suggested below to work admirably with sixth grade children.

For the first lesson, find in a basement, coal-shed, or other outside building, the web of a common, round-bodied, house spider, if possible with the spider at home. Tell the pupils to study the web for a few minutes and be ready to report everything that they see. This is strictly independent observation, without questions from the teacher or discussions on the part of the pupils. The work may be carried on as class work or assigned as individual work outside of school hours.

The observations are followed by reports from the class. Each child is asked to contribute one fact that he has discovered. If there is lack of agreement upon any point, this is referred to the class for further observation.

The reports and discussions bring out the following facts: The web is made of threads which are fastened to supports. In

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the basement the supports are the joists and window frames. Some of the threads stretch from one joist to another, some from the joist to the window frame. There are central points here and there in the web where a number of threads come together. There are a great number of criss-cross strands which make an irregular wall around a central space. Some of the threads seem finer than others. The spider is hanging in the upper part of the central cavity with back downward. A brownish gray ball is hanging in the same part of the web.

After the above facts are discussed and verified, further study is suggested. Touch some of the threads which are stretched between the supports. Are they fastened firmly? Now put your hand inside the central space and touch some of the fine threads. What happens? Test in the same way various threads in different parts of the web.

The following assignment is made for home observation: Look in your basements, coal-sheds, attics, and other places that you may think of for webs of the house-spider. Decide whether or not they are all made on essentially the same plan as the one you have just studied. Be ready to report anything new that you may find in connection with the web. Capture one of the spiders, placing it in a wide-mouthed bottle or clear glass with a cover. Look at it carefully and be ready to tell all you can about it.

The next day brings interesting reports. The experiment with the web brings out the fact that there are two kinds of silk—one dry and firm; one sticky and elastic. The uses and value of the two kinds are now discussed. Some children report that the spiders are not always in the central room of the web, but often in one corner. Some have found remains of flies and mosquitos. Others report finding slender black beetles hanging from a thread in the center of the web.

The spiders are now taken up for discussion. Each child contributes to the recitation by telling some fact that he has observed. If a pupil mentions a point not noticed by the others, the spiders, which the children have in glass jars, or bottles, are at once examined to verify the truth of the statement. If all do not agree in regard to some point, again the examination of the spiders settles the question. The teacher suggests additional observation, answers questions, and gives correct terms for various parts and organs named.

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The summary of this lesson is as follows: The house-spider has eight legs. The legs are made up of segments. The front legs are very much longer than the other legs. The body is divided into two parts. The front part is the cephalo-thorax and the hinder part the abdomen. The abdomen is very much larger than the cephalo-thorax. It is round—almost a sphere. The legs are all attached to the cephalo-thorax. The small foot-like projections in front are called palps, and belong to the mouth. The two small cylinder-like bodies between the palps are the mandibles or jaws. (This spider is too small for the children to make a detailed study of the eyes or spinnerets although some child will probably discover small eyes on the front of the head.)

Some of the children are certain to report that they have found a different kind of spider about the home. Its web is not at all like that of the round bodied house-spider. The threads seem woven together to form a sort of sheet. In one corner is a smooth tunnel-like opening. The children are told that the spider that makes this kind of a web is called a funnel weaver. The next assignment is to look for webs of these spiders, and if possible, to capture one of the owners. Several days should elapse before reports are called for. Often some child will find a funnel web near the school building and may conduct members of the class to the spot for study.

Reports of the Funnel Web Study—The funnel webs are found in corners of cellars and attics, often in front of windows. They are very numerous in grassy places. Some are found in fence corners; others in low shrubs.

The webs are flat sheets made of a great number of threads woven together. They are anchored like tents with guy ropes, some attached to supports above, some at the sides and some below. The tube-like opening is in one end, usually slanting downward. Sometimes it ends in an opening in the ground; sometimes in a knot-hole in a board or post; sometimes in a crevice in the wall or between window sashes. The spider sits in the tunnel and when disturbed, rushes quickly down this slanting staircase. When an insect alights on the web she rushes out, captures it and descends her staircase to hide away while she eats it.

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The spider of the funnel web is larger than the house-spider The cephalo-thorax is only a little smaller than the abdomen. The body and legs are covered with hairs. The palps are almost as large as legs. This spider has eight small eyes on the front part of the head. She has two projections at the end of the abdomen. These form a part of her spinnerets. The other parts are on the under side of the abdomen.

By the time we have reached that stage in the study of the spiders, some of the children will report another kind of web—the one called the round or orb web. If one of these webs is found near the building, a field trip with the class will be found profitable.

Two large orb weavers are common in gardens and fields. One is the large black and yellow autumn spider. The other a bright colored spider, sometimes light yellow, sometimes orange, or salmon pink. This spider frequently makes its web in shrubs in the garden or vines about the home. For this reason it is sometimes spoken of as the garden spider, however, this term is applied indiscriminately to a number of species.

Note the frame work of the orb web. How far do the longest lines extend? To what are they fastened? How great is the diameter of the wheel? To what are the spokes of the wheel attached? How many spokes are there? Note the thread attached to the spokes. You will find that it is a spiral. In what part of the web are the threads of the spiral farthest apart? In what part are they closest together? Describe the center or hub of the web. Touch gently with the tip of the finger or a straw, several parts of the frame work and a number of the spokes. Now touch the spiral threads. How do these differ from the framework and spokes? What do you think is the advantage of having the two kinds of silk? Where does the owner of the web remain when at rest? Do the different orb weavers behave differently in this respect?

What does the spider do when an insect becomes entangled in the web? Can you determine how the spider keeps from becoming entangled in her own web?

How does the spider make this wonderful web? Leave this as a problem to be solved. You may have to keep on the lookout for a number of days or weeks before you can answer this question. The web is usually spun in the evening. Sometimes in the early morning. If you break a few threads in the outer portion of one

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of these webs, the spider will frequently repair the break so you may be able to find out how she does it. However, she will probably wait until evening before she begins the task.

Capture one of the large orb weavers. Put it into a terrarium and place the terrarium on a table near an open window. The spider will probably make a web in the terrarium. By feeding her on flies or other insects, you will be able to answer a number of the questions asked above.

Compare these orb weavers with the house-spider and the funnel weavers, noting resemblences and differences. The spinnerets are easily studied on these large spiders. (This is a good time to compare the structure of a spider with that of an insect, noting differences.)

We have some spiders that do not spin webs for the purpose of catching prey. Look for these under logs, loose pieces of bark, and bunches of dry leaves or grass. These are known as ground or running spiders. You will often find them running about on the ground in gardens and grass plots. Some of them make holes in the ground in which they live a part of the time. Often, you can find these homes regularly because the spider makes a small web-like opening, often in a bunch of leaves leading into the home. Compare these spiders with others studied.

Late in September or early in October you will find many flying spiders. Wait for a day when the air is full of cobwebs stretching from one shrub or tree, building or fence-post to another. See if you can find the origin of these numerous threads. Trace one of the threads from one support to another to see how far it extends. Look sharply on the ends of twigs or garden paling for the spiders that are making the webs. If you watch closely you may be able to find out just how they do it. Are these spiders large or small?

The velvety black jumping spiders are always very abundant at this time. Watch them as they move about on some object. Place a straw or stick in front of one to see what it does. Place one on a small twig or stick, holding this near another object to determine how far the spider will jump. Allow it to drop from the end of the stick and determine how it swings on the end of a web and how it clambers back to the stick. How do the legs of the jumpers differ from those of the other spiders?

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Place one of the black jumping spiders in your glass bottle and look for the eyes and mandibles. Keep some of them in captivity for a few days to determine whether they make any kind of a web.

There is yet another spider that you may find in the fall. Look on flowers—clusters of golden-rods for a small yellow spider. What is its shape? What is peculiar about its legs? What does it do when you touch it? It is called a crab spider. Can you tell why?

Besides the spiders named above, you may find in the woods or orchards some of the interesting hunch-backs that make wonderful webs and are themselves wonderfully protected by their colorings.

The children will be sure to find, while they are carrying on the investigations of spiders and their homes, a number of egg sacs or cocoons. Begin early to make a collection of these. Place them in boxes or glass jars in the schoolroom for further study.

If you have one of the large orb weavers in your terrarium you will be almost certain to find after a few weeks, an egg cocoon hanging in the web or in a corner of the terrarium.

A grass spider placed in a box or glass with a few bits of dry leaves will rarely fail to deposit a cocoon of eggs.

The egg cocoons of the house-spider, as we have already noticed, are found hanging in the upper portion of the irregular web and may be removed for study.

Compare the different egg cocoons as to size, color, shape, and outside covering. Which ones seem best fitted for protection against weather conditions? Where were these found?

Open two or three cocoons and note the size, color and number of eggs. Keep a number of the cocoons in the terrarium or glasses until the young spiders emerge.

Make a careful study of the young spiders. In what do they differ from the mature spider? Are they able to spin webs from the very beginning? Watch carefully to determine how they start away from the egg sac. Keep some of them in a cool place until spring, to make a further study of the young spiders.

Raise the problem as to how spiders spend the winter. Place some of the glasses with the jumping spiders, crab spiders, funnel weavers and house-spiders in a cool place in the basement to see whether or not they live over winter. A field trip very late in

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autumn or early winter may help to solve the problem. Look under loose pieces of bark also under logs and boards for webs in which spiders are enclosed for their winter sleep. Have the children watch house-spiders that remain in their webs in cellars or attics to determine whether they remain alive during the winter months.

Additional Facts

The study of spiders conducted as suggested above, means that the children are investigating, observing, seeing things as they are, and drawing conclusions from what they see. They are gaining knowledge at first hand and are having a good time while they are doing it. There are, however, some facts of interest concerning spiders that the children will not be able to discover for themselves. These may be told by the teacher. In my own work I find that most of the facts indicated below, have been given in response to questions on the part of the pupils.

The Silk and the Spinnerets—The silk is secreted in liquid form by glands in the back part of the abdomen. The spinnerets consist of six blunt projections resembling finger tips, which are located in the back part of the abdomen on the under side. Each spinneret has a great number of small tube-like openings. When the spider wishes to spin, she gently presses a spinneret against some object and forces a small amount of liquid from the spinnerets. This sticks to the object. Then she moves her spinnerets in just the right way to draw the liquid from the tubes. The instant it comes in contact with the air, it hardens into a thread. The liquid pours out of all the small openings, but the many threads unite to form one before they are dry.

We have found that there are two kinds of silk. The sticky kind is spun by using one set of spinnerets and the dry by the use of another set. The spider uses the different kinds of silk as she chooses. The claws on the hind legs are used to aid in manipulating the thread.

The Poison Fangs—Are spiders poisonous and where does the poison come from—are familiar questions. At the tip of each mandible is a sharp spine-like claw. The children may be able to see this in some of the larger spiders. This spine is called the poison fang. In the head just above the mandibles are small glands which secrete a posionous juice. A small duct extends from the gland to each poison fang. The spider uses the fang

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to pierce the bodies of insects. At the same time she inserts a drop of poison which probably insures death more quickly. The fang is rarely used to bite human beings, never unless a person is handling a spider and is bitten in self-defense. If this should happen, the bite is no more serious than the sting of the bee.

The Orb Weavers—Nothing is more fascinating than to watch an orb weaver spin her web. She first selects the site for the beginning of the web, usually a twig or leaf of some tree, shrub, or vine. She covers this with a net-work of threads. Then she clings to the edge of the support, her back downward, her spinnerets upward and extending outward in the direction that the wind is blowing. While in this position, she sends out a stream of silk. The breeze carries the threads far out. Some of them are likely to catch upon some support. With a quick movement she turns and touches her spinnerets to the support. Again she turns with her head in the direction of the wind, and with the claws of her front feet, gently pulls upon one thread after another. When she finds one that is fastened at the further end, she at once fastens it firmly to the support on which she stands. Then she performs a most wonderful feat. With back downward, she runs along this frail, swaying thread until she reaches the farthest end. She spins another thread as she goes, to reinforce the first one. So rapidly does she move that she seems to float through the air instead of running along an almost invisible thread. She goes back and forth over this thread a number of times, strengthening it at each trip, with a new strand.

This thread is the beginning of the frame-work of the web. The spider now makes other firm threads in a similar manner, some extending in one direction some in another, each attached to some object. Then comes the spokes of the wheel. When these are in, the spider starts at the center, spinning a wide spiral of dry silk. She uses this afterwards as a sort of scaffolding upon which to walk while she puts in the spiral of sticky silk. She begins this at the outer portion of the web and works toward the center. While doing this she cuts out the first spiral. The black and yellow autumn spider places a zig-zag band across the hub of her web, evidently to strengthen it.

The Flying Spiders—While there are a number of small adult spiders that may be seen flying through the air on their webs, most of the flying spiders you find are the young of larger spiders.

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This is one method of distributing themselves over wide areas. When a spider wishes to move off in this way, it fastens a thread to a support, either a garden paling, the tip of a twig or the edge of a building. Then it stands on its front feet, elevating the abdomen as high as possible, at the same time allowing a stream of silk to flow out. When this silk thread is sufficiently strong to bear the weight of the spider, the little creature lets go and sails off on the thread, letting out more string as it flies.

Learning to Read a Roadside.

C. M. GOETHE

Almond-eyed Okimoto, chasing cicadas along rice paddy paths, lined with brilliant amaryillis, imprisoning his catches in tiny bamboo cages, where they sang for him as canaries might for American bairns; blue-eyed Hendrick, of the wooden shoe loving cup, and the village museum, with its Audubon society; Maggie of purple heather land, with her "school treat" and her "wee beasties"; Alois, feather in his emerald mountain hat, with his sister, learning about alpenrosen and of Morgarten, climbing like goats to Rigikulm; blind Hialmar of Hanchristianandersenland, learning the music of the wild birds in the Royal deer park; little Miss Cawasjee arrayed in gorgeous silks, on a palm lined highway out from Bombay, chasing the bright colored butterflies of the tropic skies—or wandering with a score of her fellow students through the wonderful bird market with the brilliantly plumaged birds from the jungles of the Spice Islands and Africa, enjoying the exotic "school treat" even under India's burning sun; Johann of Lubueck, Gretchen of the golden braids like the wild roses of her native Hannover moors; this international group clasped hands recently and made their bow to the NATURE-STUDY REVIEW's readers.

It was all about "learning to read a roadside." Sometime ago the many attired group of lads and lassies were introduced to a California community through a bit of City Planning. Out of this work came the slogan:

"*A child has the same right to be taught to read a roadside as it has to read a book.*"

This battlecry is the result of years of effort by social workers and conferences with experts. It may be deemed of value to other communities.

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Here is how it came into being: The Chamber of Commerce of Sacramento, appreciating that its city, like most western ones, contained merely the germ of its future growth, determined to organize a volunteer city planning group, aimed to be the founda-

FIG. 1. Combining studies of outdoor art and of nature, Hildesheim, Germany. Each child has his rucksack with provisions—sometimes everything necessary for an overnight stay.

tion of a municipal city planning department, just as in the gold mining days a volunteer fire department with hand drawn engines had formed the basis of a later, city-owned system.

Professor Zueblin and Mr. Charles Mulford Robinson had already laid the foundation of the work. Then Dr. Werner Hegemann of Berlin was engaged. Out of his survey came the Committee of 150. This was divided into 15 sections. A Subsection was devoted to nature study extension. The school law of California required instruction in agriculture and nature study.

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But public sentiment had not been sufficiently crystallized to demand much of these.

The study of their city brought some surprise to the Sacramento business men. They had certain self-satisfied, complacent

FIG. 2. Blind children of Copenhagen upon a nature study field excursion in the Royal Deer Park. Even the afflicted may learn the music of song birds.

smugness about their home town. Business had flowed on with an apparently regular average of prosperity and all seemed well, just as it had from the days when the rush across the Indian-infested plains by prairie-schooner, met, at Sacramento, the rush over the fever stricken Panama, and from the long dreary trade route "around the Horn."

Then came the awakening—those few years when skyscrapers commenced to replace the old one-and-two story store buildings—when asphalt was laid in place of streets of cobbles, which once unmercifully jolted the mule teams from the mines.

As the city planning progressed, more than one lesson was learned. A housing expert came. A connection was established

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between nearly every case of tuberculosis at the County Hospital and the cheap lodging houses. Then arrangements were made with the university for a broader housing campaign. It was learned that the city had almost lost one new factory partially because of bad housing. A direct connection was established between realty values and commercial profits on one side and clean civic life upon another.

The doctrine of the survival of the fittest was shown to apply to the struggle for existence between cities just as between male elephants in the jungle, or among plants on the arid desert border.

As one expert followed another, as Sacramentans commenced to learn new things about their own town, a volunteer was called for to go to Europe to study, following Dr. Hegemann's recommendations, City Planning in

1st, Certain Mediterranean Cities whose climate resembled Sacramento's.

2d, The wonderfully efficient city building, including schools, of Germany, Denmark and Switzerland.

The call was answered—the investigation made. Based upon these, the report was made that Teutonic, Scandanavian, Anglo Saxon Europe seemed as far ahead of California in nature study, particularly field excursions, as the Old World was behind America in the development of the playground and school social center.

* * *

Then there came new thoughts about the inter-dependence between business and even education. Studies of German and Swiss vocational schools showed how these countries, in raising the standard of efficiency in the use of their greatest asset,—their children,—had met and solved a problem which was also coming to America.

Along with this insight into European vocational training came a new glimpse into the use of the nature study tramp, not only as a means of inexpensive and at the same time highly gratifying recreation—but, its value educationally—in turning out from its schools a product better equipped for its battle with the world, with clearness to see, to comprehend.

The scientific training came to be understood as one of the great causes why the German flag at that time was replacing the English and the Americans in the harbor just across the Pacific—in China, Japan and the Straits Settlements—why the red, white and black

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was the only banner of a white nation that flew in increasing numbers in competition with the rapidly expanding fleet of Japan.

Then was adopted the slogan: "*Our children have the same right to be taught to read a roadside as a book.*"

Since crystallization of public sentiment seemed the one essential thing, practically the same course was decided upon as had been

FIG. 3. A schoolboy in Frankfurt, Germany, ready for a long "tramp". German manufacturers tell me the wonderful efficiency of their men is largely based upon this training, enabling them to see clearly, truthfully. If every American manufacturer could see the results of this in China, Japan, etc., we would have a nation wide demand for these field excursions, even tho we ignored the aesthetic side.

successful in creating a municipal playground system for Sacramento.

(1) A volunteer organization. (This already existed in the Nature-Study Extension Section of the Committee of 150).

(2) A campaign of publicity through:

(a) Short but constantly repeated newsy paragraphs in the press.

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(b) Lectures and talks before various civic and other organizations.

(3) Following this, bringing to the city a trained expert organizer.

The newspapers, as in the playground campaign, gave generously of their space. Photographs were published, one at a time, about a week apart, accompanied by the stories of Okimoto, and Alois, Hialmar and Hendrick.

The Parent Teachers Associations were valuable aids. Little by little friends were found who were missionaries. Germans, Danes, Swiss who knew the value of the field excursions from their own childhood were especially valuable in that word-of-mouth creation of public opinion so well known to the old time political boss. Under the latter's leadership was organized selfishness. Here was organized unselfishness—human betterment.

Then the University of California was appealed to for an expert. This institution had been co-operating with the State Fish and Game Commission. The latter was systematizing permanent wild life conservation.

They responded sympathetically. The slogan about reading a roadside was directly in accord with their policy to substitute a love of the wild life, for the game destroying tendencies of the old generation of Californians, who had mined gold, broken the virgin soil, and cut the forests.

It was a policy to largely substitute the camera and the field glass of the bird lover for the gun. It was a policy which, stamped upon the plastic child mind, the fact that it was lots more fun to study through a glass a titmouse feeding its nestlings than to shoot it.

So the school authorities, the Fish and Game Commission, the University and the Chamber of Commerce City Planners are working together. Dr. Bryant is organizing both teachers and pupils, so far with unexpected success. Grownups, as well as lads and lassies, are learning that a roadside can be read as well as a book, that such reading is more fun than a circus. An official of the Fish and Game Commission said the other day—"If this continues we will have the nature study field excursions in every school in California. Can we not look forward expectantly to the time, perhaps one or two generations hence, when every American child will, like the yellow-haired blue-eyed bairns of Denmark—

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have the enjoyment of what will have then crystallized into a right—the same right to be taught to read a roadside as to be taught to read a book.

Nature-Play in the Mountains

CHARLES LINCOLN EDWARDS
Los Angeles City Schools

The primitive man experiment carried through by Joe Knowles in Klamath Forest, California, during the summer of 1914, has emphasized the need of a knowledge of the plants and animals necessary to survival if one is lost. This test demonstrated that the man of today, without clothes, weapons, or other modern implements is able to wrest a living from the wilderness. The majority of people are complacent parasites upon civilization. The virile resourcefulness of the ancient peoples is often well nigh lost. It is highly important that we and our children should be awakened to the use of the innate powers we have inherited from our tree-dwelling and cliff-climbing ancestors.

It fell to the lot of Professor Waterman, of the University of California, and myself, to act as judges in this single-handed contest waged by Mr. Knowles with the hard conditions of nature. The success of this remarkable test has inspired our nature-play in Los Angeles throughout the autumn. I have asked the children in one group after another, of our one hundred and thirty-one elemenatry schools, the following question: "If you were lost in the forest, what would you do about it; sit down and cry your eyes out, or run about like a chicken with his head cut off?" As a matter of fact the large majority of lost people do one of these things; either give up in wailing despair and starve with food all about them, or profitlessly run here and there, until exhausted through misdirected energy. So our pupils have learned about the edible wild plants in season in their own neighborhoods, such as the common roadside mallow, with its "cheeses," wild mustard, green seeds of the wild radish, shepherds'-purse, water-cress, acorns and other nuts. Then the common hoarhound and anise have exemplified plants with medicinal qualities, and the poison-oak, Jimson-weed and nightshade, forms to be avoided because of a more or less poisonous character.

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We have taken many tramps into various canyons and over the crest and up the peaks of the Sierra Madre Mountains. Last June our general school excursion to Mt. Wilson, numbered one thousand participants. On this perfect June day two miles of light hearted children winding up the mountain trail presented a wonderful exemplification of nature-play. Some of the larger pupils went all the way to the summit where the Carnegie Observatory is located. Nearly everyone reached the half-way house where pines and spruces had become inter-mingled with the

FIG. 1. On the crest of the Sierra Madre.

sycamores, maples, and various oaks, especially the dominant live-oak. All the way through the canyon the brook sang its beautiful song, as its clear, ice-cold waters swirled among the rocks. Under stones in the pools, the orange-colored water-dogs, or salamanders, could not successfully hide from our sharp-eyed young naturalists, who also found their jelly-coated eggs. Later the tadpoles hatched and swam about in the school aquaria. The soaproot, a member of the lily family, grows high up on the mountains. The Indians eat the bulbous stem which is covered with brown, cocoanut-like fibers. They also rub the saponin containing plant in the water of deep pools, cut off from the stream. The lather thus made stupifies the trout which then float to the surface and are secured.

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Under the influence of the Knowles experiment we have taken small week-end parties into the mountains. The boys have made their beds on level places under the trees. Rolled up in blankets, upon freshly harvested fallen leaves, redolent of the forest, and roofed in only by a clear sky crowded with stars, the young adventurers have rested after the day's climbing. One night, midway to dawn, a little fellow ran to me crying—"Say, there's a big owl up in the tree, throwing nuts at me." I reassured the lad and soon, lying down by my side, he was dreaming again.

FIG. 2. In the Little Santa Anita Canyon.

Early one morning, before the first rays of the sun had lighted the mountain crest, in Indian file the boys and I stole quietly up toward the head of little Santa Anita Canyon. In some places the sides of solid rock above the rushing water were so steep we had almost to hang on by our teeth. Finally, in a forest glade not fifty yards from us, three black-tail deer, two does and a fawn, stood still for several minutes while we paused to watch the graceful creatures. Our friend, who holds a lease of the region for his camp, has treated the deer so kindly that they will frequently approach near to the cabins. In past hunting seasons many of these beautiful animals have been murdered by city sportsmen, just for the fun of it. The "sport" of shooting one of these deer,

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half-tamed by kindness, is about equal to that of going into a farmer's pasture at dawn and killing a sleeping calf. This year, however, our friend established a game protection more effective than the California law. For three days before the hunting season opened a forest ranger was hired to climb back and forth up the

FIG. 3. Tramping up Mount Washburn.

mountains, firing blank cartridges at all the deer in sight. In this manner the frightened creatures were driven so high up among the remote peaks that when, at the legal time, the sportsmen came to their usual haunts, they did not secure a single deer.

We cut wood and removed the bark from tree-trunks with sharp-edged rocks and were thus independent of knives and

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hatchets. Dead-falls may be constructed from logs to entrap animals for food and for clothing made from the tanned skins. An animal may be skinned, a pit-fall dug, or a house built, with a rock. One could cut through the largest redwood tree in California with such a stone-age instrument although a month or more might be required for the task. It is well for a boy to realize that when lost in the forest he is not apt to have a tool-chest hanging around his neck. An important function of nature-study is to give adequate preparation for survival in the presence of the catastrophies of life.

The Indians have shown us how to kindle a fire by the friction of one stick rubbed against another. With the string of a bow coiled once and a half around the spindle which is held above by a cap-piece and fitted below into the hollow of a bed-piece, a little heap of fine dust is drilled out. In a minute or two smoke arises then a spark appears in the dust and this may be blown against the punk until the flame is born and fire has been made, just as the aboriginals have kindled millions of fires in the two hundred thousand years of their struggle toward civilization before matches were invented.

Our pupils have been taught to braid and weave. In any forest long witch-grass from swampy places and the soft inner bark of the fir, or the thin tough bark of young willows may be found. From such materials rope is braided and mats, blankets, clothes and hats woven. Even a kettle which will hold water may be woven from fine grass, or made from a cylinder of bark sewed together at the ends. In such a kettle it is easy to cook a ground-squirrel, or rabbit stew by dropping in heated stones until the savory food is ready to be served in bark dishes.

At our city headquarters we have a nature room with electricity, hot and cold water, sinks, gas-stoves and twenty work-tables. Here any boy, girl, teacher, or citizen, is invited to come with the raw material and make of it whatever pleases the fancy. Spreading-boards for moths and butterflies and glass-covered insect cases are constructed. Tanks are manufactured, either of glass or cement and the plants and animals installed to form either a fresh- or salt-water balanced aquarium. Gophers, moles and ground-squirrels are trapped to stuff as museum specimens or to tan their skins into leather. Thus we are able to demonstrate that pests causing a loss of a million dollars a year in Southern

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California may be transformed into a profitable resource. When such animals are found to be worth money their extermination is not such a hopeless problem.

Thus our boys and girls go into the mountains for nature-play. They enjoy climbing even with a week-end pack of blankets and provisions on their backs. On one trip we covered twenty-four miles in two days. As the height increases the panorama spreads to wider distances until, at the last, the blue Pacific bounds the

FIG. 4. Ready for the return.

view. Just at this winter season we leave oranges ripening in the orchards on the mesa and in a few hours are able to build snow-men and forts and pelt one another with snowballs on the mountain crests. We enjoy the variety and beauty of the scenery. Many animals and plants are collected and brought back for some useful manufacture in the nature room or for exhibition in the school museum. Among the rocks and trees the wits are sharpened as the hands perform the simple processes of forest life. We watch the plume-tailed gray squirrel on the big-coned pine while the noisy red-shafted flicker volplanes from tree to tree. From the tracks on the trail we learn what fellow animals have preceded us and often just what they were doing: whether

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playing, courting, home-making, hunting, or being hunted, in the endless struggle for life, where the one who thinks quickest and most accurately lives and rules.

Our School Garden

BESSIE COOPER

Teachers who are alive to the best interests of the children under their care, no longer question the advisability of having a school garden, but wherever it is at all possible they provide a plot of ground where the children may work and study.

Formerly we aimed through our garden work to give the child first, an interest in and love for plants, second, a knowledge of ways of planting and caring for different plants and third, a desire to apply this knowledge, so that he would make use of it in caring for a garden at home. Experience has shown that the knowledge gained in school was not always applied, that the child needed more help than we were giving him, and that the parents must be interested. Now, we are not only trying to accomplish our former aims but we are actually connecting the work of the school garden with the home garden work. Thus the third grade child begins helping to provide for the family needs. Also, the products of the school garden are not only planted and cared for by the children, but they are being prepared for sale, sold at market price, and the money is spent by the pupils in some legitimate way. This is found to make the garden work much more profitable and even more interesting than before. The children greatly enjoy seeing how much money they can make a small plot of ground produce, and finding how much they can save for father and mother by raising vegetables themselves.

Perhaps greater care must be taken in planning for the lower grade garden work, than in the upper grades. Here the children are not able to do so much work and the interest cannot be sustained for so long a period of time. In selecting seeds care is taken that seeds of both early and late maturing plants are included in the order. The quick maturing ones are needed that the little ones become interested early and soon see results of their work, while the later ones sustain interest and give fall work.

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It is also important that the plants are rather hardy—little hands are sometimes rough and hoes will sometimes strike where they should not—and that plants are suitable for home garden.

Last year the second grade decided they would raise onions (from sets), radishes, beets and carrots. The third grade, where the study of transplanting is begun and where the home garden work is first strongly emphasized, to raise cabbage, tomatoes, radishes and onions.

In the third grade each child wrote a letter to his parents asking for a plot of ground to be used for a garden. He promised to learn how to plant and care for the plants at school and to do all the work himself. Nineteen parents from the class of twenty responded favorably. The twentieth boy lived upstairs and had no place for a garden.

It seemed best that the children should work in groups in the school garden, those who sit in one row in the school room usually work at one row in the garden. The plot should not be so large that it cannot be well cared for, even if the weather is so bad that work is interfered with at times, as it is almost sure to be. The second grade plot was 19 feet by 13½ feet being equally divided into plots for onions, radishes, beets and carrots. The third grade plot was 25 feet by 21 feet. This gave room for radish and onion beds, each 11 feet by 13 feet, a cabbage plot 10 feet by 12 feet and a tomato plot 12 feet by 12 feet. The cabbage plants were set two feet apart and the tomato plants three feet apart. Paths were left between all rows and between all plots.

The entire garden plot was measured and marked off into smaller plots for the different kinds of vegetables and for paths. Each smaller plot was prepared for planting as the time came for planting this kind of vegetable. The children then prepared the home plots in the same way. After the planting at school was done and they learned how to prepare the bed and sow the seed they were furnished with a small quantity of seeds or they purchased them for themselves. Then they began their planting at home. The tomato and cabbage plants were raised in window boxes or in hot beds at school and after the transplanting at school each child took his share of the plants home and set them out.

In one corner of the school room the blackboard was used as a place for recording garden work. As soon as a child had radishes or onions large enough to use on the family table he brought

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a sample to school to show that this was true. This sample was examined and admired by all, and the facts recorded on the board opposite the child's name. All vegetables raised at home were eaten at the family table.

Whenever possible the gardens were visited by the teacher.

As the vegetables matured in the school garden, pupils and teacher looked about for a place where they could be sold. Usually there was no difficulty in finding some good housewife who was glad to buy from the children rather than from the grocer. The product sold, the children went to the garden, and if it were radishes or onions they were selling, pulled, washed and tied them neatly in bunches. Two or more children, were then chosen to deliver and collect the money. This phase of the work gave an opportunity for practical arithmetic work.

Because of the extreme drought last year, the tomato and cabbage crop were not as good as they should have been. This, however, brought in an interesting problem with which the gardener must contend. Tomato worms (tomato sphinx moth larvae) and cabbage worms (cabbage butterfly larvae) were extremely troublesome. This gave abundant material for moth and butterfly study. Even with these drawbacks, and we always have some, the plot gave the following money returns aside from the valuable training:

Sale of Onions	$1.35
Radishes	2.55
Tomateos and Cabbage	1.40
Total	$5.30

The second grade plot gave these returns:

Sale of Onions and Radishes	$2.20
Beets and Carrots	1.20
	$3.40

The money was deposited in the bank as collected and was to be spent later for things the children wished for their school room. Pictures and gold fish have been purchased from last year's fund.

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Bread from Stones

A. N. NOLAN
University of Illinois

A circular entitled "Bread from Stones," written by Doctor C. G. Hopkins of the Illinois Experiment Station, has become an agricultural classic. It is now in its third edition and nearly 100,000 copies have been distributed into all parts of the United States. The circular tells the story of Doctor Hopkins' success in bringing back economically a worn-out farm in Southern Illinois to profitable production.

The farm under consideration consisted of about 300 acres of poor gray prairie land and was purchased in November, 1903, for less than $20.00 an acre. It was known in the community as the "Poorland Farm," and Doctor Hopkins adopted that name for his farm. The work of restoration was begun at first on only 40 acres of the farm. This particular 40 was bought at $15.00 an acre. It had been agriculturally abandoned for five years prior to this purchase. It was covered with a growth of red sorrel, poverty grass and weeds. The land was sour, dead, and depleted of plant food. During the ten years following the purchase of the farm, the 40 acres received the following treatment:

1903	Fall	Purchased, $15.00 per acre.
1903	Fall	Applied one ton per acre—fine ground rock phosphate.
1903	Fall	Plowed for corn for next year.
1904	Spring and Summer	Corn crops.
1904	Fall	Applied limestone, two tons per acre.
1905	Spring	Soy beans.
1905	Fall	Wheat.
1906	Spring	Clover sowed in wheat.
1907	Spring	Timothy and more clover.
1908 1909	}	Meadow and pasture.
1909	Fall	Applied rock phosphate.
1909	Fall	Plowed down for corn.
1910	Spring and Summer	Corn crop.
1911	Spring	Oats—volunteer clover appeared.
1912	Spring and Summer	Clover harvested.
1912	Fall	Plowed for wheat.
1912	Fall	Applied limestone—two tons per acre.
1913	Summer	Wheat harvest.

NOTE—Once during the ten years six loads per acre of barnyard manure were applied to the forty acres.

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Only 39 acres were in wheat, a lane having been fenced off on one side of the field. The yields were as follows:

1½ acres with farm manure only—11½ bushels per acre.

1½ acres with farm manure and one application of ground limestone—15 bushels per acre.

36 acres, with farm manure two applications of ground limestone, and two of fine ground phosphate in the rotation as described above, 35½ bushels per acre.

Here we have a yield of wheat about double that of the average land of the state. The practical farmer will naturally ask, "What did all this cost?" The average annual cost for the purchase, delivery, and application of the limestone and phosphate was $1.75 per acre. In the ten years then, the total cost was $17.50 per acre. Add to this the original cost $15.00 per acre, making $32.50 and still you have pretty cheap land to produce double the average of the state. Doctor Hopkins puts it this way. "The average annual investment of $1.75 resulted in the increase of 24 bushels of wheat (35½–11½) per acre in 1913. Thus we may say that the previous application of these two natural rocks, or stones, brought about the production in 1913 of 864 bushels of wheat, an amount sufficient to furnish a years' supply of bread for more than a hundred people."

This story of the "Poorland Farm" is a remarkable instance of the conservation of one of our greatest resources, the soil. Conservation means a saving of the resource by a wise use of it. At the end of ten years of use the soil on the "Poorland Farm" is producing more wheat than the average production of the state, and at the same time its fertility is increasing year by year.

The Activities of One Live Rural School Teacher

Extracts from a letter written by Mrs. Hattie Crandall to Anna Botsford Comstock.

District No. 5, Scott, Cortland County

The teacher who started to teach the school in the fall of 1912 was taken sick after having taught four days and after waiting as long as they felt they could for her, they decided to engage another teacher so I took the school and at that time it was getting rather late for collecting weeds, etc., but I suggested to the pupils that we begin a collection of seeds, weeds, plants, woods and anything in the

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line they would like to bring and at first it was rather amusing the things I received.

We had no good place for storing them so were obliged to have the things on the window-sills and in boxes, but they kept increasing slowly at first until a little enthusiasm was aroused by seeing others working.

After the specimens were pressed and dried we took nearly all of one afternoon getting them mounted.

At Thanksgiving time we had a social and the children gave a short program after which we had an auction sale of the vegetables donated for the "Thanksgiving corner" and cleared $12.08 and with what the state aided us we added 52 books to the library, some of which were to aid us in our study of nature.

In the spring, as the school grounds were needed for playgrounds and also were too shady for gardening, I tried to rent a piece of ground from a field just across the road from the schoolyard for the school garden. The neighbor would not rent it to me but *gave* us the use of a corner in the field, while another gave us a load of fertilizer and we planted potatoes, corn, beans, beets, salsify, etc.

During the noon hours we made trips into the neighboring fields and Arbor Day, after we had finished raking the yard and the refuse was burned, we took our dinner and went to the woods returning to the school house about three o'clock with flowers, ferns, mosses, etc. We put some of the things in press, set out some ferns then did a little more of the mounting work before returning home.

At the close of the spring term we had an ice-cream social. One of the pupils took his father's horse and buggy one night after school and we canvassed the district for eggs, milk, sugar and some gave us money so we realized from it twenty-one dollars the proceeds of which we used to purchase a nature-study cabinet for our exhibits.

During the summer vacation there was scarcely a week passed that there was not something brought to my home, which was just out of the district, that the pupils thought would add to the collection.

They had done so nicely that I had decided to take the things to the county fair. One afternoon the week before the fair opened I invited the larger children to my home to help prepare the work that had been collected and after working for a time we had a little

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lunch then worked again. I told them we were not to work for a prize but we would try to have the *best* work then if we were deserving of a prize we would receive it and if others had better of course they would get it but we would know that we had done the best we could. The result was we received the second premium on our flowers, beets, beans and barks and the first premium on our sunflower, insects, seeds, grains, weeds and the ten-dollar prize for the best nature-study exhibit making in all $24.50 for the school. With this money we purchased some large Rochester hanging lamps to light the school building and of course that called for an oil can and some oil, then we bought a nice dictionary rack, etc.

In the meantime I had been engaged to teach the school again this year so after the fall term opened we decided to have another social to get books such as the older members of the district would enjoy reading also and by so doing help to draw the school and homes nearer together. We invited Rev. E. E. Merring of Homer, who is very enthusiastic over the study of birds and nature herself, to be present and give us a talk on birds, and our district superintendent Charles W. Ellis, Jr., of McGraw, was also present and gave us a short talk on the work being carried on, both of which were much appreciated. In connection with the evening's work we had a flower stand, and guessing games. The result of this social, although a very rainy night, gave us six dollars and ten cents, which added to what was left from our fair money and with the state's aid we have just added fifty-five more volumes to our library.

Last year we had a bird chart and made a collection of the leaves and flowers of the trees and also had an aquarium in which they placed the frog and toad eggs and watched the development of the same. This year I intend to add a flower and a miscellaneous chart along with the other work.

Last year, owing to the change in teachers, the Cornell Rural School Leaflets sent were lost and we were unable to get one until after the day set for "Corn Day," therefore, nothing was done in that line but this year we had exercises and there were nineteen visitors present and the ladies as well as gentlemen gave us some interesting talks on corn and its uses. We sent an ear of corn to Cornell for the Farmers' Week and also sent one of the boxes of our mounted collections on which we received the blue ribbon which pleased the children very much.

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Last summer I gave a prize to the pupil destroying the most tent caterpillar nests and this winter I offered a prize to the pupil bringing the greatest number of nests of the eggs and the boy who received the prize brought 1,535 nests which will make quite a difference in the number of worms to hatch in the spring.

Some of the parents have said to me that they had learned more about birds and weeds since their children had come to school to me than they ever knew about them before. I asked them if it did not make life pleasanter for them and they said it certainly did, so you see this work is not only making life pleasanter for the pupils but the parents as well.

I will close by giving part of the pupils school yell which is as follows:

"We have worked, we are working, we will work!
We are the pupils who do not shirk!!"

They are certainly doing good work in other branches of school work as well as in the nature work.

Hoping this will be something such as you wanted and thanking you for the "Bird Note Book" I remain,

Sincerely yours,
(Mrs.) HATTIE CRANDALL.

The Public School as a Neighborhood Centre

MABEL CARNEY

People living in the country, especially in the thinly settled parts see, often with a tightening of the heart strings, the leaves fall, the shortening days darken, roads grow rough, and hard to travel, skies gray, cold and cheerless, and animate life take on a hush, knowing well that these are the precursors of long silences ahead till spring with the returning sun brings back renewal of life with flowers to the field and birds to the open country. In summer in these same places the danger of making life "all work and no play" is very great, while both the isolation and drudgery dishearten young people, and rob them of rightful joys in life, while some of their highest powers are atrophied through lack of use. For this reason provision should be made there for play and for the cultivation and development of the social instinct common to all.

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If "Union is Strength" politically, commercially and strategically, so also is it socially, and it is in the country that the strain of *denominational* division is most severely felt, not only in support of the church, but in the social life of the people.

The School in Pioneer Days

Time was when the country school was the centre of the social and every other life of the community. Those were pioneer days when life was a struggle with elementals, when our parents and grandparents were hewing homes out of the wilderness. To be able to attend school then was a privilege indeed. Some could manage no more than two or three months in the year; some were restricted to night school and that in the winter only.

Those were the days of Singing-Schools, Spelling-Matches, Debates, in which everyone was interested and everyone took part. Life then was a community life and the school was its center. In those days people were neighbors to one another in the true sense of the word; and if we have lost the virtue of neighborliness as has been said we have, it is perhaps something to our credit that we reverence its memory and desire its return.

With the development of the country came more means, more leisure, more opportunity for study, till in process of time we find the once coveted privilege of attending school replaced by a Compulsory Attendance Act!

The rude home-made benches of the old log school once crowded by bearded men and boys eager to learn, often studying by candle light, have given place to modern schools with single seats and polished desks, too often alas! empty. It would almost seem that in removing the disabilities of education we have lost the desire for it. What is difficult of attainment has ever been a coveted prize.

"The little rift within the lute
That made the music dumb."

Gradually the efforts of the people to make their own pleasures, were relaxed. New fashions in entertainment were introduced. The youth flocked to the village to listen to the hired entertainer or to watch others making merry *for a price*, while the old folks stayed at home with their memories, their fears and their rheumatisms, life in the country all the while growing more monotonous to the young and lonely to the old. Thus slowly but surely the

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foundations of the rural problem were laid *through the failure of the school to develop and keep pace with the development of other institutions.*

Bending all its energies to give the youth a training which would fit them to make their way in the world, which meant their way in the city, it took no thought for the training necessary to equip for life those who were to remain in the country on the farm. It took no note of the social needs of these; of the play and relaxation as necessary to these as to people living in the city, for country folk are not built on one plan and city folk on another; they have the same social instincts. The school gradually lost its old connection with the pupils out of school hours; it had no bearing on the lives of country children *as such*, nor any connection with their life after they left school.

Present Day Conditions

Except in rare cases the doors of the rural school to-day are locked except between the hours of nine and four, for five days of the week, during forty weeks in the year; and in so far as the social life of the coummnity is concerned, they might as well be locked in perpetuity and "the key thrown down the well."

Children, as a rule, enter school at too tender an age to be kept there all day, but from the first day till the last it is push, cram, memorize, prepare for examinations. Both parents and teachers are obessed by the glory of getting the children through the Entrance Examinations at a very early age. So engrossed are they in this that they lose sight of one of the most important factors in education,—namely, that of play. The training in resourcefulness in making their own pleasures is wholly neglected. Indeed play is looked on with but scant courtesy in the country. They say there, "You will never make a living by that"—that hideous spectre of *making a living.*

It is high time that people realize that we are in the world not merely *to make a living*, but *to live.* And to live means to be that kind of boy or girl, man or woman, that the world is some bit more breautiful, happier and better for his or her existence. For all such there is a living safe enough.

Sociologists have long realized the importance of play in the lives of people; and teachers and social workers are learning more and more that their chief opportunity for character building in the

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young is not in making them write compositions on Unselfishness with all the capitals and punctuation marks in their right places, but in getting them out in the playground and teaching them games in which they practice unselfishness. It is a well known theory of pedagogy that the practice of a virtue must precede its realization. You cannot make a child understand Honesty until you make him do the honest thing, and scorn the dishonest. Children through play learn to practice every one of the virtues which the human race has, so far, evolved. The understanding of them is swift to follow.

But it is not alone the children who should play; every man and woman in the community should play too. Moreover, it is better far for the children to have their fathers and mothers, grandfathers and grandmothers too, finding new life and happiness playing with them.

Horace Greeley once said, "To be conscious of a need is to be far on the way to its fulfilment." The great thing for us is a realization of the fact that rural communities are suffering through having no adequate provision for the cultivation and development of the social side of their natures, for lack of community ideals, for lack of a center about which the life of the whole neighborhood might revolve.

Unique Position of the School

The position occupied by the school is unique. All are supporters of it, all have an equal right in it. It is undenominational and hence free from the weakening effects of division. It is centrally located. It is a permanent institution. Its future is assured. Children are required to attend there regularly during certain prescribed years, and for this reason they will readily gather there for recreation and coöperation in social undertakings, after they have graduated from the school. These considerations make the public school a suitable center for the neighborhood life.

Teachers as Leaders

The next and perhaps most important consideration is to find *leaders* in this movement; and it is to the Teachers that we must look for these. It should appeal to them as a *great opportunity for service*. To lead in sports, not for the development of athletic stars, for this means that a few experts or eccentrics are doing

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things, the rest merely looking on; but for the raising of the standard of enjoyment of life for every boy and girl, man and woman in the community. "Games are games and healthful and recreative," says G. K. Chesterton, "so long as everyone wants to join in them; when they become an art, everyone wants to look on."

The school may lead in the cultivation of a spirit of coöperation and community of aim,

> "When none were for a Party
> But all were for the State," as in
> "The brave days of old,"

lead in the cultivation of song, in the study of history and literature and in questions of national import, giving to those who through stress of circumstances had been obliged to leave school at an early age, an opportunity to improve their knowledge of these things, making thereby for a more enlightened community through the trained intelligence of the individual members.

The school grounds might be fitted up for sports and picnics in summer, while in winter, when the long evenings and greater freedom from farm work give opportunity for social intercourse, the school might be the center where old and young would gather for evenings instructive, entertaining, joyous, in which everyone has some part. Valuable aid to the movement might be secured by enlisting the coöperation of the Women's Institute, whose members have earned the reputation of "doing things." Their meetings might be held in the school rooms.

As individuals differ in tastes and attainments, so do communities; and therefore no detailed plan may be given which would suit in every section. Teachers and their aides must adapt these to the needs and capacities of the people in each particular case.

Then, as in the pioneer days, when in the old log school all the community met together and made merry in song and story, in games and in the breaking of bread, so must gather into the much more capacious and comfortable school of today, all the people of the community, ministering to each other's needs, harking back to the good old days of neighborliness and community of aim, working together for the common good; making wholesome fun and sport for themselves, helping to solve the problem of making life in the country satisfying to all the needs of a normal human being.

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Present Requirements in the United States in Instruction in Nature Study and Elementary Agriculture

ELLIOT R. DOWNING

Early in the year a letter was sent to the Superintendent of Public instruction or equivalent official in each state and territory of the United States, requesting information as to whether or not Nature-Study and Elementary Agriculture are required to be taught under their several jurisdictions. A copy of the prescribed or suggested Course of Study in these subjects was also requested, if such was published. Replies were received from every state and territory but two; and the desired information was obtained from prominent members of our Society in these two cases. The data so secured was tabulated and a copy of the tabulation was sent in July to each Superintendent of Public Instruction for his approval, if correct, and his revision if in any way inaccurate. The information given in the tabulation below should be therefore temporarily dependable. In some states the teaching of Agriculture and Nature-Study in the schools is mandatory by specific legal requirements. In others it is required by the state Educational Department. This distinction is indicated in the tabulation. Unless stated that the requirement is by law, it is to be inferred that it is merely a requirement issued on the authority of the State Superintendent of Public Instruction. In some cases there may be error on this point, a legal requirement existing where none is stated, as the letters received were not always absolutely clear on this matter.

TABULATION OF REQUIREMENTS IN NATURE STUDY AND ELEMENTARY AGRICULTURE IN THE GRADED SCHOOLS OF THE SEVERAL STATES AND TERRITORIES

State	Nature Study Required	State Course Issued	Agriculture Course Required	State Course Issued
Alabama	Req. grades 1–3	Yes	Req. grades 6–7, by law	Yes
Arizona	No, recommended	Yes	Not taught in grades	
Arkansas	No		Yes, by law	
California	No, merely suggested	No	No, merely suggested	No
Colorado	No, suggested in state course	Yes	No, suggested in state course	Yes
Connecticut	No		No, but is taught in country schools	

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State	Nature Study Required	State Course Issued	Agriculture Course Required	State Course Issued
Delaware	No		Yes	
Dist. of Columbia	Yes, and full course of study outlined	Yes	No	
Florida	"Required in most primary depts."	County Courses	Yes, by law	County Courses
Georgia	Yes, Gr. 1–6		Yes, grade 7, by law	
Idaho	Gr. 1–5 as outlined in Course of Study	Yes	Only in High School	Yes
Illinois	No, but outlined in St. Course of Study	Yes	No, but outlined in St. Course of Study	Yes
Indiana	No	Yes	Yes, by law in township schools	Yes
Iowa	No, Course outlined	Yes	Yes, by law	Yes
Kansas	No		Yes, in 8th grade	Yes
Kentucky	"No, many schools teaching it"		"No, many schools teaching it"	
Louisiana	Yes, by law	Yes	Yes, by law	Yes
Maine	No	Yes	No	
Maryland	Yes	Yes	Yes	
Massachusetts	No		No, fully outlined	Yes
Michigan	No		Required by law for County 8th grade examin't'ns, so rural schools must teach it	Yes
Minnesota	No	Yes	No	
Mississippi	No, but usually taught		Yes, by law	
Missouri	Yes	Yes	Yes	Yes
Montana	No		No	
Nebraska	"No, but generally taught	Yes	"No, but generally taught"	Yes
Nevada	No		No	
New Hampshire	"No, but outlined in state course"	Yes	"No, but outlined in state course"	Yes
New Jersey	No, but taught in most schools		No, but taught in most schools	
New Mexico	No		Required by State Sup't on basis of law requiring industrial education	
New York	Yes	Yes	Yes	Yes
North Carolina	No		Required in Farm life schools	Yes
North Dakota	"No, but taught in practically all schools of state"		Yes, by law	
Ohio	No, but Ag usually taught as Nature-Study in early grades		Yes, by law except in city schools	Yes

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State	Nature-Study Required	State Course Issued	Agriculture Course Required	State Course Issued
Oklahoma	Yes	Yes	Yes, by law	Yes
Oregon	No		No	
Pennsylvania	No, "but taught in most of our schools		Yes, by law in T'w'p high schools, taught in most rural schools	
Rhode Island	"No, but taught in most schools"		"No, but taught in most schools"	
South Carolina	Yes, by law		Yes, by law	
South Dakota	No, optional		No, but in state course of study	Yes
Tennessee	No		In 8th grade	
Texas	No		Yes	
Utah	Yes	Yes	Yes	Yes
Vermont	No	Yes	No	Yes
Virginia	No			
Washington	No, in state course	Yes	Yes, provisionally	Yes
West Virginia	No		In all elementary schools, by law	Yes
Wisconsin	No, taught to some extent	Yes	"One of the regular subjects in our common schools	Yes
Wyoming	Yes		Yes, by law	Yes
Alaska	No		No	
Hawaii	No		No, but work in agriculture is emphasized	
Philippines	Yes, as gardening in upper primary grades		Yes, in intermediate grades	
Porto Rico	Yes	Yes	Yes	

News and Notes for September

All nature lovers very much desire to see instruction imparted in our schools which will result in the preservation of bird life. However, all are not quite so certain in their methods of securing such instruction. In the schools of Peru this consummation is accomplished both in the training department of the Normal School, under the direction of Miss Alice Burley, and in the primary grades of the village public schools, by the organization of the pupils into what is known as the Bird Lovers' Club. These children not only take an active interest in the migration and

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nesting of the birds but are led to stand forth for their protection as well. This has been accomplished by having each, during the month of March, make or have made, a small wren house which is brought to the school room. Here it is put upon exhibition after it has been painted. After this bird home has been thus prepared, each pupil takes his particular bird house to his own home yard where it is put up early enough in the season for the little house wren to find it on his northward migration. And a

Bird Lover's Club, Peru, (Nebr.) Normal.

surprisingly large number of these little birds have found these homes in this village. As one goes about the streets in almost any section of the community he is greeted by the song of the wrens. Those in touch with the child life of this community say that within the last two or three years, since the organization and active work of this bird club, the attitude of the boys and girls toward the birds has almost completely changed. While formerly it was not an uncommon thing to hear a boy or girl speak of having shot or crippled some bird, it is now almost unheard of. The ownership of the bird house has thus lead each boy and girl to feel a paternal interest in all the feathered residents in the community.

B. CLIFFORD HENDRICKS.

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Remember that A. B. Seymour offers to send specimens of plants and some animals you may need at cost of package and postage. Several readers have been supplied with wheat rust at 25c. Address him care of Comstock Publishing Company, who will forward requests to him.

The Chautauqua (N. Y.) *Quarterly* for April was a Nature-Study edition, announcing the natuarl history courses for the summer in charge of S. C. Schmucker, Vaughan MacCaughey and W. G. Burroughs.

The Rockford, Ill., Nature-Study Society has published in pamphlet form a very neat list of the trees of their locality.

The Platteville, Wis., Normal School has issued their course of Study for the Training School, in which the science course bears evidence of painstaking work on the part of Fred T. Ullrich, who is in charge of the science work.

Dean Sanderson, of the Agricultural College, University of West Virginia, well-known for his book on entomology, has resigned his position, and is doing graduate work in the Department of Sociology, University of Chicago.

Miss Florence Billig takes the position as Supervisor of Nature-Study in the grades in the Normal School at Emporia, Kansas. Miss Mary Payne is to be Supervisor of Nature-Study at Winetka, Ill., and Miss Clara Dietz takes a similar position at Glencoe, Ill. All these are University of Chicago students.

Sargent's Handbook of the Best Private Schools (published by the author at 50 Congress Street, Boston), contains besides its list of schools and its directories, some 46 pages devoted to summer camps. Among the 300 camps for boys or for girls listed in the compilation table, Nature-Study is among the "special features" announced for one or more of these camps.

Permit me to add my hearty endorsement of the clear exposition of a point in present-day pedagogy by Professor Hart, in his article appearing in the April number of *The Rural Educator*; namely, "Nature-study—a natural, first-hand way of learning some old things," that is, learning by observing the things of nature rather than by reading in books about them. Let me point out also, how utterly at variance this is to the idea advanced by

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Professor Mairs, in the March number, that "in nature-study the plant or animal is considered in relation to its natural surroundings alone; its adaptation by nature to its natural surroundings, without any thought of its relation to civilized man. In agriculture the relation of the organism, plant or animal, to modern society is the primary idea. . ." The first fallacy is the mistaken assumption that nature-study (hyphenated by the American Nature-Study Society and the NATURE-STUDY REVIEW) is confined to a consideration of plants and animals; for it is concerned equally with inanimate nature and its processes, as, snow, evaporation, freezing, minerals, and even soils. The second fallacy is the denial that nature-study has any rights to objects of nature as related to us as human beings. In other words, we may study a bulbous plant that grows in the woods properly enough as nature-study; but if we plant a hyacinth as a part of school work and use our observations as a basis for language lessons, we are not doing nature-study. Or again, children's observations of a robin building its nest, feeding its young, and even of the worms fed, are nature-study; but the moment we ask whether the worms are harmful to our nasturtiums and whether, then, the robin is of some benefit, we cease to be doing nature-study but are in the realm of agriculture, which is a *reductio ad absurdum*. This may seem to be quibbling, but Professor Mair's construction seems so strained and at variance with the accepted views of men who are leaders alike in the field of agricultural education and of nature-study with L. H. Bailey at the head of the list, that the pronouncement should not be allowed to pass without a protest.

Very truly yours,

C. H. ROBISON.

State Normal School,
Upper Montclair, N. J.
April 18, 1914.

Several hundred feeding baskets and beautiful rustic bird-houses have been installed by the West Laurel Hill and Laurel Cemeteries, Philadelphia, Pa., with the advice and assistance of The Farm Journal Liberty Bell Bird Club in the hope of attracting some of the migrating birds to stay there all winter, as well as to provide attractive homes for the regular sweet-voiced visitors of summer.

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Mr. A. L. Smith, treasurer of the West Laurel Hill Company, and Mr. Chas. P. Shoffner, artist, and editor of The Liberty Bell Bird Club Department of *The Farm Journal*, laid out the plans for this work in such a way as to enhance the beauty of these ideal places for bird sanctuaries.

"The happy bird families that find a haven of refuge in these cemeteries will not only make them more cheerful and attractive to the thousands of visitors, but will prove most useful in keeping down the insect pests which would otherwise injure the beautiful flowers, trees and shrubbery in these sanctuaries," says Mr. Shoffner, whose enthusiasm for bird conservation has done so much to build up The Liberty Bell Bird Club to its present large membership.

Mr. Shoffner hopes that the example of the management of the West Laurel Hill and the Laurel Hill Cemeteries will be followed by others all over the country, and he will be glad to assist any company desiring to do anything in this direction.

INDIANAPOLIS, Ind., May 20, 1915.

Enclosed you will please find a copy of a bird contest. On May 15th another member of the Nature-Study Club and myself led the Club for an outing at a point 12 miles west of this city, and in view of the occasion I got up this list so that it might afford some amusement for the members while enjoying the beauties of nature.

I have filled in the proper names of the birds that apply to these various pseudonyms.

A prize was given to the one guessing the most and one little girl about 12 years old guessed 13 of the 21.

E. R. TIBBETS.

BIRD CONTEST

Saturday, May 15th

1. A sad farmer. Blue Jay.
2. An unsteady light. Flicker.
3. A crowned head. King Bird.
4. The two R's. Robin Red Breast.
5. A cigar stump. Snipe.
6. Ruler of the fisheries. Kingfisher.
7. A financial sup. Bank Swallow.
8. One high in Catholic circles. Cardinal.
9. An eastern city visitor. Baltimore Oriole.
10. A peace mourner. Mourning Dove.
11. A yellow conversationalist. Yellow Breasted Chat.
12. Punishment of the waif. Whip-poor-will.
13. A solitude dweller. Hermit Thrush.

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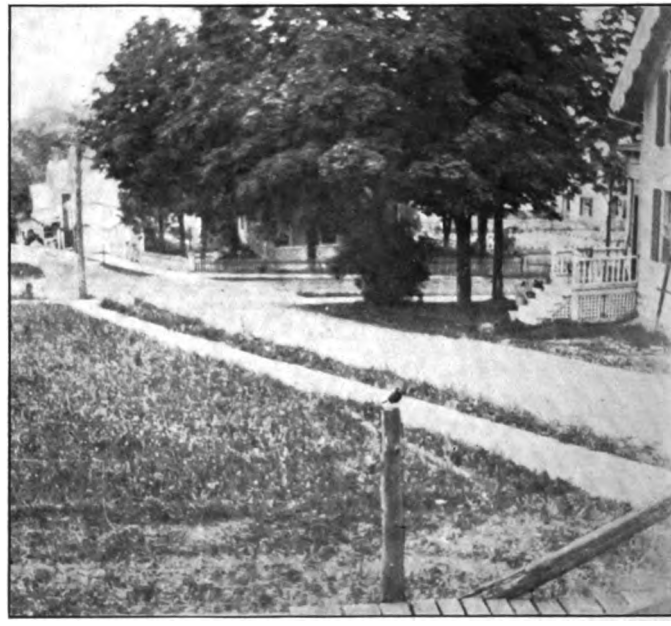
14. "57" varieties. Mocking Bird.
15. Sorrel top driller. Red Headed Woodpecker.
16. Chocolate Baby. Brown Creeper.
17. A plant vocalist. Myrtle Warbler.
18. Tanned harvester. Brown Thrasher.
19. A famous whiskey. Old Crow.
20. An outdoor spree. Meadow Lark.
21. The pride of the farm. Quail.

Name of contestant.....



Can you beat it?

You will see by the picture that robins are birds of the village as well as the farm.

This mother robin is one of a pair who have used the same nest for two years, which was built in an elm tree on my lawn.

DORABEL E. HARRIS,
Port Henry, N. Y.

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Book Reviews

FARM ANIMALS, Hunt, Thomas F., and Burkett, Charles W. Orange Judd Company, 1914. Pp. ix + 534. Price $1.50.

The tendency to differentiate the course in Agriculture so as to include separate courses in such phases of the subject as Farm Crops and Soils, Farm Animals, and Farm Mechanics, has brought forth several text books which recognize this differentiation. Probably no more comprehensive single volume treatment has been presented than this one by Hunt and Burkett. It includes: a brief statement of the great groups of animals and domestication of animals (three chapters); the significance of animal food and animal feeding, digestion, and rations (six chapters); horses, mules, beef and dairy cattle, sheep, hogs and goats (nineteen chapters); a chapter on bees; six chapters on poultry; four chapters on diseases and injuries of farm animals; one on butchery and one on marketing. The book presents an immense quantity of useful information which should prove helpful to those who are teaching a course which deals with farm animals.

OTIS W. CALDWELL.

AGRICULTURE AND LIFE, Cromwell, Arthur D., edited by Davis, Kary C. J. B. Lippincott Company, 1915. Pp. x + 369.

It is not the purpose of the author of this book to present a text book for high school pupils, but to help the teacher of agriculture. After considering the educational aims of agricultural teaching, the author discusses some of the more important agricultural topics with the intent of making the educational ends of each topic clear, and of bringing together a fund of information which should help the teacher whose agricultural knowledge is fairly well limited to the regular text book on the subject. For example, in a chapter on "Pets and Home Projects" a statement is made of why the motor-minded pupil, probably all pupils for that matter, should be assured an opportunity of following some project in which he uses his hands, muscles, eyes and ears, as well as his reasoning powers. Rural pupils are likely to have a good deal of opportunity to use their whole bodies in carrying out assigned projects, but agricultural education may easily become so formalized that it may eliminate some of its most fundamentally educative elements. Not only the work of the farm, but its play,—

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harnessing the dog or calf, or training the colt, making a cart by use of old wheels, etc.,—are valuable farm projects when seen from a truly educational point of view.

The materials of the book are not new. They are merely assembled in a new relation, so that the meaning of their use in education is pointed out. The book will be highly suggestive to more teachers of agriculture and to young teachers it will be particularly valuable by applying much interesting information to supplement the text, but more than all by holding constantly before them "what it's all about."

OTIS W. CALDWELL.

THE ROMANCE OF THE BEAVER, A. Radclyffe Dugmore. Pp. xiv + 225. J. B. Lippincott Co.

This book is the result of miles of travel, toting a pack or paddling a canoe just on purpose to study the beaver. It is an exceedingly interesting account of the life and work of the animal, illustrated by over a hundred cuts, mostly reproductions of photographs taken in the wilds. It will take its place beside Morgan's "American Beaver and His Works" as a contribution to the natural history of the beaver.

Dugmore is a firm believer in the reasoning power and understanding of a beaver. To quote: "Their intelligence is shown by the way in which they will add water to a brook whose supply seems inadequate to their needs. They will turn other streams into the one which is failing them, by digging ditches to carry the water, by even diverting an entire stream towards their own, and by tapping springs by means of small ditches. Numberless incidents of a more or less similar nature could be told to prove that by the means employed in doing the work the beaver reasons with the utmost clearness, while the results of their work justify us in believing that they thoroughly appreciate what are, or should be, the ends." (p. 72).

Describing the building of the house, he quotes from Enos Mills' "In Beaver World," previously reviewed here (September, 1913), who says of the ventilating flue, "But little earthy matter is used in the tip-top of the house where the minute disjointed air-holes between the interlaced poles give the room scanty ventilation." Then Dugmore goes on to say, "We are of course faced with the question, Does the beaver do this intentionally with the

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realization of what it means? Why not? What reasonable excuse can we have for doubting his understanding of what he is doing?" (p. 18). I would reply to his "Why not?"—the law of parsimony, used everywhere in natural science, that (applying it here specifically) phenomena explained by instinct are never to be referred to intelligence. These actions of the beaver, complicated as they are, seem no more so nor more consciously purposeful than the selection of the proper food plants for its larvae by the milk-weed butterfly as it lays its eggs, or than the excavation of a nest hole by a woodpecker. Yet these are regarded customarily as instinctive acts.

He asserts that the beavers "are always ready to grapple with new problems" (p. 46), which would be good evidence if true. But the phenomenon he says is new, a heavy rain and consequent rise of the river, is undoubtedly older than the beaver. Certainly his discussion of the beaver's intelligence shows little appreciation of the problems involved or familiarity with the literature of animal intelligence. His explanation of the development of instinct is even more unscientific. A mother beaver assisted by the young is working on the house (p. 8). "This needed more sticks and the weak places had to be filled in with sod and mud. The young assisted in this work, each bringing his small load and arranging it *as he had seen his parents do.*" (The italics are mine.) It is unfortunate to have one's credulity shaken in the accuracy of the observation by such inaccurate interpretation. The actual statement of facts seems authentic, but it would have made a stronger appeal if the author had been more cautious in his conclusions.

THE BUTTERFLY GUIDE; A Pocket Manual. W. T. Holland. 237 p. Doubleday, Page & Co. $1.00.

This is another one of those handy guides similar to the bird books,—guide, etc., from the same press. Some sixty pages are devoted to the structure, life history and methods of collecting. The rest of the book is made up of brief descriptions of the common species, accompanied by the same illustrations (295) in color as are found in the author's larger butterfly book. The author's previous books are guarantee of the excellence of this one.

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CARE OF HOME AQUARIA, Raymond C. Osborne. Published in pamphlet form with 63 pages.

This is one of the New York Aquarium Nature series. It is intended as a guide on the establishment and care of the aquarium, and gives directions as to stocking, feeding, and keeping clean and comfortable the variety of animals that one is likely to want to keep either in a fresh water or salt water aquarium. It may be obtained from the New York Zoological Society.

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THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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VOL. 11 OCTOBER, 1915 No. 7

Nature-Study and the Common Forms of Animal Life. II.

By Dr. R. W. SHUFELDT

(Reproductions of photographs from life by the author).

In the May, 1915, issue of THE NATURE-STUDY REVIEW I attempted to point out the great advantage to be derived from publishing good illustrations of as many of our common animals as possible, or of those forms of life that the young student of nature is most apt to meet with and should, without hesitation, be able to name. Such illustrations should be, whenever possible, reproductions of photographs from life, the photographs being, in any case, of a class that presents the animal thus taken in such a way that it instantly suggests to the mind of the observer that form in nature which it is intended to represent.

As pointed out in the above article, this was the first of a series of contributions of that class which I hoped to publish, from time to time, in THE REVIEW, the present article being the second of the series. Each animal figured will be briefly described in the text, so that, in due course of time, all of these articles will constitute quite a respectable little handbook or guide to the identification of many of our American forms of animal life. To be sure, such figures, with their appropriate text matter, are to be found to-day in a great many different kinds of works on biology and natural history; but the young student of nature is not always in a position to secure these for his own library, or even to borrow them from the libraries of others. In any event, it is far more satisfactory to have them on one's own bookshelf, where they can be consulted in the REVIEW at any and at all times.

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When a boy or a girl has acquired the habit of *accurate observation*, not only has a power of great value been cultivated, but that very ability carries the young student a long ways toward becoming a good naturalist; and a good naturalist—in the broadest sense of that term—is one of the rarest of individuals to be met with in the human family, no matter in what part of the world we may look for one.

When animals of any kind are met with in their natural haunts—from mammals to insects—there are, with respect to identifying them, *three* things in chief to be borne in mind, demanding the exercise of our best powers of accurate observation; the matters of *form*, *color*, and *size*. Correct discernment in regard to these may, in many instances, be supplemented—with respect to promptly recognizing the forms observed—by the knowledge possessed on the part of the observer of the habits, behavior under certain circumstances, and the habitats (the places where they are usually found) of the animals observed. Within comparatively recent time, one of the most beautiful of American wild birds has been completely exterminated—chiefly through the agency of man. This bird was the Wild Pigeon (*Ectopistes migratorius*), which occurred, in the early part of the last century, in certain parts of Eastern United States in unnumbered millions. Not one of these, nor a single descendant of any of them, are in existence; the bird is entirely extinct. Since its extinction, high rewards have been offered to any one locating a nest containing a fresh clutch of eggs laid by a female of that species. Although these rewards have been standing for two or three years, no such nest has been either found or reported; and it is perfectly safe to predict that no such nest will ever be found again in this world, or, as for the matter of that, in any other; for a species *once extinct* is *never* again reproduced in nature.

While no nests of the Wild Pigeon were found, scores of reports, from all parts of the country, have been coming in for several years past from persons who claim to have seen, all the way from a Wild Pigeon or two, to a flock numbering from seventy-five to seven hundred of these birds. Not long ago, a man wrote me from California that he knew where the Wild Pigeon existed in thousands in that State, and that he was on his way to shoot them at the time of his writing me. I offered him one hundred dollars in cash if he would send me the tail feathers of a male Wild Pigeon, taken

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from a specimen of any of those he brought home from his hunt. On the other hand, if they failed to be those of a male Wild Pigeon (*Ectopistes migratorius*), he was to pay me fifty dollars. That put a quietus on his boasting, and I subsequently learned from another party that the birds he saw were the wild Band-tailed Pigeon—a

FIG. 5. The Mourning Dove; adult female. Captive specimen. Photo by the author. Reduced.

not uncommon bird at this time in some parts of California. On the whole, however, the bird which has most frequently been mistaken for the extinct Wild Pigeon is our well-known Mourning Dove (*Zenaidura macroura caroliensis*), a specimen of which species is here reproduced in Figure 5.

Now in some parts of the country these Mourning Doves congregate in great flocks, and in their flights they do, to a certain extent and to the untrained eye, resemble the extinct Wild Pigeon.

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However, notwithstanding that both these species have long, graduated tails, with the feathers tipped with white; that they are considerably alike in their flight, and are really of the same family, no good observer of birds could possibly mistake the Mourning Dove for the extinct form of Wild Pigeon. The latter was a much larger bird; the male had a brilliant chestnut-red breast, while its prevailing color was a fine slate blue; in fact, in old times many called them "Blue Pigeons."

A still more indifferent power of observation is exemplified in mistaking the Band-tailed Pigeon (*Columba f. faciata*), of the West, for the extinct Wild Pigeon, as the former does not possess the long, graduated tail; the prevailing color is entirely different, and the action of the bird is not the same. All these cases to which I refer are simply those of malobservation, and malobservation of a kind that no well trained and well informed student of birds should be guilty of at any time.

Our Mourning Dove (Fig. 5) lays normally two white, ellipsoidal eggs to the set, the nest being a somewhat flimsy structure, chiefly composed of fine twigs and sticks. A typical example of one of these nests, with the two, very young, downy squabs in it, is here shown in Figure 7. This nest I photographed *in situ*, the birds having built it in a spruce tree in Virginia, across the Potomac River from Washington. It is but slightly reduced from natural size, and gives an excellent idea of the nest and young of the Mourning Dove.

One day this spring (1915), when Mrs. Shufeldt and I were taking one of our tramps through the woods, we found ourselves by the side of a pretty stream that passes the point where we were, not five minutes' walk from our home, well within the city limits of Washington, D. C. We had been hunting for different species of salamanders, and I had rolled over a good many logs and big stones in the damp and boggy places near this stream, capturing numerous specimens of several species, as the Gray Salamander (*Plethodon cinereus*); The Red-backed Salamander (*P. c. erythronotus*); the Slimy Salamander (*Plethodon glutinosus*); the Two-lined or Yellow-backed Salamander (*Spelerpes bilineatus*), and others, while, as a matter of fact, I was really searching for a good specimen of the Spotted Salamander (*Amblystoma punctatum*), it being a species I had never seen alive, much less collected, although I had hunted for it for many seasons around Washington and in northern Virginia without success.

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FIG. 6. Young Mourning Dove and Nest

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We were, as I say, but a few moments' walk from home, when I determined to turn over a great, water-logged stump, four or five feet long, which was more than half embedded in a miry spring close to the bank of the stream. As the mud and water flowed in to fill the cavity left by the log as I slowly lifted it up, I thought I saw in it the head of some sort of snake or other; but without waiting for any snap identification, I plunged my free hand into the mire and seized the specimen as it was sinking into the mud. To my great delight it was a grand specimen of the long looked-for Spotted Salamander. It measured no less than seven and a half inches in length; and next day I made a number of fine negatives of my captive, one of which has been reproduced to illustrate the present article (Fig. 7). At the time of taking this salamander, the earliest spring flowers were just beginning to put in an appearance, and among the Skunk's Cabbage (*Spathyema foetida*) shown at the center of the picture, with the Rattle-snake plantain to the left (*Peramium repens*), the *Goodyera repens* of Gray.

This specimen of the Spotted Salamander was only the fifth ever taken in the District of Columbia, three of the other four having been collected by Dr. Edgar A. Mearns, of the Army, one of the naturalists who accompanied Colonel Roosevelt on his African Expedition. My specimen is now in an aquarium in my study, with numerous other species; it is somewhat darker and stouter than when first captured, and is a most striking looking representative of its genus. The general color above is a dark lavender, appearing almost black in certain lights; this color is much paler beneath. A row of round, brilliant orange spots—each of about the size of a very small pea—extend down either side to the end of the tail. There are from nine to ten spots in each row, while others occur on the head. Very fine spots of the same color are on the sides and on the limbs. Bluish-white spots are scattered over the lower parts, and some of these are found to extend up on the sides of the body.

A good many species of Amblystoma occur in the United States, and the literature referring to them is rather extensive. Prof. St. George Mivart, F.R.S., in his very useful little book "The Common Frog," publishes a wood cut of this Spotted Salamander on page 41, and what he says about these animals is very important and interesting. None of them are in the least harmful, though ignorant people and most boys kill them whenever they come across them in the woods.

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FIG. 7. The Spotted Salamander. Photo natural size, by the author

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There are some excellent remarks about Salamanders and Newts, with good cuts of a number of species, in "The Batrachians of the Vicinity of New York City" by Raymond L. Ditmars, the naturalist. Copies of it may be had by applying to the Secretary of the American Museum of Natural History of New York City (Guide Leaflet No. 20).

Passing from Salamanders to Toads—which latter are also Batrachians—it may be noted that we have a very considerable list of them in this country. Indeed, a small volume might be written about the American toads alone; and, were a book devoted

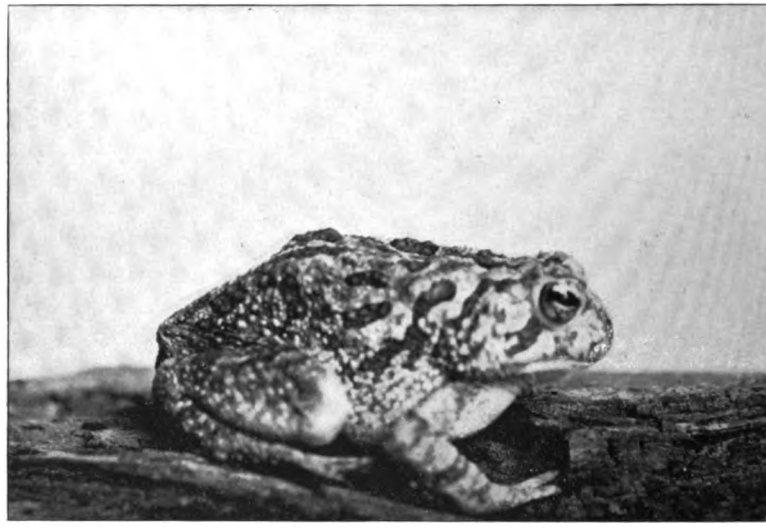

FIG. 8. Common American Toad (*Bufo leutiginosus*). Photo natural size, by the author.

to all we know about them, it would make a very sizeable volume.

A fine specimen of our Common Toad is shown in Figure 8 of the present article. With many of its congeners it belongs in the family *Bufonidæ*, and is very abundant in certain localities of the eastern States. There is but one other species with which it might be confused, and that is the Spade-foot Toad (*Scaphiopus holbrooki*) —a much rarer form, with very interesting habits.

Our "horned toads" of the West are lizards and not toads at all, not any more than tree-toads are toads, the latter being members of the frog or raniform group. Later on, in another article of this series, I will come back to our American toads and frogs, and perhaps give an entire chapter to the subject, presenting more species and treating the whole more fully.

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Grade Prospects—The Poultry Club

A. M. Blood

True education is obtained by doing, not by learning how to do. The boy that has played fair on the playground until he is prejudiced against foul play has thereby done more to establish character than he would have done by learning the ten commandments and all of the platitudes in literature.

If children are to develop into industrious, efficient men and women they should do more in school than learn how to be industrious and how to solve the industrial problems of life. They should by participating in industrial pursuits during the habit forming period, form the habit of being industrious and be led to meet real situations instead of imaginary ones. To this end I believe an industry should be developed in each grade above the first: an industry that would vitalize arithmetic and language work, be a basis for business training and an important factor in character building.

The want of all the year round supervision is the great obstacle in undertakings of this kind and is met, only in part, by carefully organizing the work for the summer months and by securing the coöperation of committees from the adult clubs of the community.

In our school at Park Ridge, our most successful project for applying our theory to practice has been our chicken industry.

We began by building a chicken house which we endeavored to make a model in design and workmanship. It was built in sections which were tacked together inside the manual training room and later removed to the chosen site where the building was completed.

In the spring we organized in our fourth grade the Fifth Grade Poultry Club. Officers were elected, committees appointed, and plans laid for promoting the business.

Each member paid in ten cents for a share and the total amount comprised the paid up capital of the club. They bought their equipment, three clucks and some feed, secured some eggs, and commenced business.

The Park Ridge Business Men's Association gave them twenty-five day old chicks, Fischel of Indiana sent them a sitting of eggs from his famous White Rock stock and poultry breeders from Illinois and Michigan volunteered their coöperation.

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The capital of the club was soon exhausted and, as no income was in sight, a meeting was called to discuss the situation. They decided that if they were to continue the business it would be necessary to borrow money. So they went to the bank and the banker told them that he would furnish the loan if they could give security. This a committee succeeded in obtaining from a Park Ridge business man. Each member of the entire class wrote out a note on blanks furnished by the bank and one of these notes was

The Park Ridge Fifth Grade Poultry Club.

taken to the guarantor who refused to sign it because of an error. After the error had been corrected, the note was duly signed and they secured the money.

A few days ago, when their treasury was almost depleted, their note became due. The class made a complete invoice of the stock of the Club and a report of the assets and liabilities. A meeting of the club was called to consider the matter. When the report was read one member arose and said, "Mr. President, I resign from

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the Poultry Club." But when he was informed that he would have to sell his stock for what he could get, and, in addition to this, pay his share of the indebtedness, he decided to stick until the money market improved. After due deliberation, the Club decided to continue the business and proceeded to devise ways and means to pay the principal and interest due at the bank and to keep afloat. They sold some chickens, increased their membership, voted to allow members to hold more than one share, and secured a new loan for a smaller sum and a shorter time.

There are a few pupils in the grade that do not belong to the Club, but they solve all problems, attend the meetings, participate in the discussions and all other educational features, and occasionally volunteer to help care for the chickens.

All take a keen interest in the arithmetic involved and some rank differently in the class when solving these problems than they do when working from a book. After they secured their first loan some of the "duller" ones could figure the interest without a pencil while some of the "brighter" ones failed. Their problem was: "If we have to pay six cents for the use of $1.00 for one year, how much will we have to pay for the use of $10.00 for one-half year?" The eggs are brought daily to the school room and sold to the highest bidder. All figure the problem and thus get practice in handling all fractions from halves to twelfths.

Each one in the grade acts as book-keeper for the Club. All bills are paid by check and each one keeps a check book, but only the Treasurer's signature is valid at the bank. Each one keeps the minutes of the meetings and attends to the correspondence of the Club as if he were the Secretary. This correspondence includes the writing of business letters and letters of appreciation to friends. These letters are read and discussed, the good points are commended and then all make another effort. The best letter is then selected for the Secretary to copy.

Nearly all the duties of the Club are performed by committees. There is a committee on information whose duty it is to consult poultry fanciers concerning the best methods of conducting the business while all the members are encouraged to read literature on the subject and report to the Club.

We selected the Fifth Grade for this industry because it is in this grade that we emphasize fractions, the keeping of accounts and letter writing.

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Then too, each member learns something of the conduct and responsibilities of a business enterprise. It was appalling to see how blissfully irresponsible some of them were. The poor chickens have at times suffered from neglect and the Club has lost chickens and has had feed wasted and equipment stolen because of the indifference of a few who could always give some weak excuse for the nonperformance of duty. We now keep a record of the reliability of each one and are having much better results.

They have had misfortunes from the first in seeming mockery of their attempted scientific management. February 1, 1915, found them in debt and with practically no income, but since then their hens have done splendidly and substantial dividends are now assured. Each member will be paid his share of the profits and must sell his stock when he leaves the grade.

Many pupils have a home industry of their own and many more are planning to have. At an "Egg Laying Contest," held last May under the auspices of the Park Ridge Business Men's Association provision was made for 49 pens of two birds each. Only children under 16 years of age were permitted to enter their hens, but all pens were filled and the later arrivals turned away. The contest lasted six weeks. Premiums valued in all at about $300.00 were awarded to the winners and valuable lessons were learned concerning the feeding and care of hens.

Even if our experiment in our fifth grade does not prove a success financially it has now proven to be a success educationally and I think justifies our opinion that real industries should be developed in the grades. An eighth grade bank, a printing company, a strawberry club, a parsley club, a tomato club, a bee club and other similar organizations would be important assets to our curricula.

Nature-Study in the War Zone

C. M. GOETHE

Four wooden-shoed men, in round caps, blue blouses, and the baggy, many-patched trousers that make the Dutch fishermen so popular as artists' models, were shuffling along the brick sidewalk on one side of a medieval-looking square in a little Holland village. On the other side, a market woman was carrying two baskets balanced from a pole across her shoulders. The baskets were

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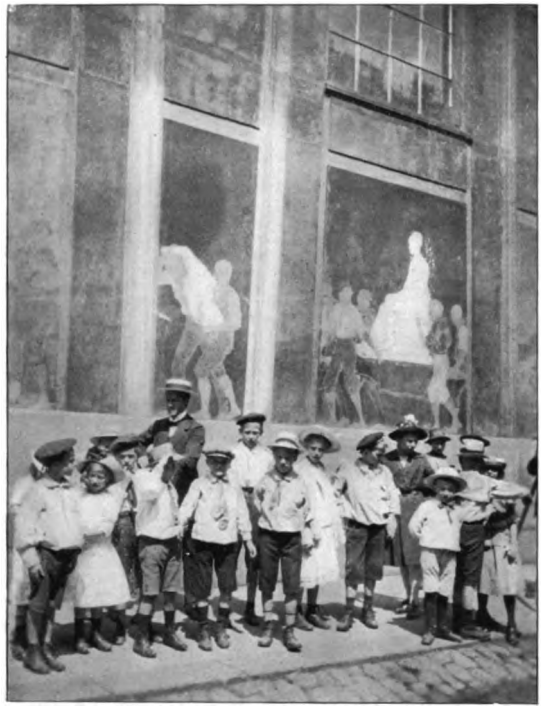
filled with cotton wrapped hothouse peaches. The woman wore the neat lace cap and broad silver head piece of her district.

Out from a side lane, to the fountain darted two wooden shoed children. The elder, a girl, held her mouth beneath the drip, then,



Rural School at the Thornwaldsen Museum, Copenhagen.

The leader is a candidate for a teacher's certificate. His success depends upon his proving by the compositions of these blue eyed, yellow haired bairns that he has the ability to impart knowledge on such walks. When told that we had no such institutions in the schools of my town, his eyes brightened and he said: "Now I understand why I read of American boys being restless in school. Ours are so happy they never grow tired."

filling her wooden shoe, handed this strange loving cup to her wee brother, too short to reach the dropping nectar.

It seemed so different from America. A few squares away was the village museum. It included the accumulations of years of

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field excursions of the school children. On alternate Fridays, a score of wooden shoes clatter along the brick paved dike, following the schoolmaster in the happiest of all school hours, learning to know a-field, "the wee beasties."

This particular group has been organized into what in America would be called an Audubon Society. The village museum, the school, are the centers around which crystallize an interest that lasts till golden hairs become silvered.

Up among the bonnie bræs of Scotland a group are more or less patiently awaiting a delayed train. The station sign reads "Melrose." Some of the people are Americans, who in the pale moonlight of the previous evening have been trying to "see aright," the old abbey that William of Deloraine visited. There is a group of children. One American asks a wee lassie, "Are you going on a picnic?" "Oh! no sir, we are on a school treat!" "But what's a school treat?" "Why, a picnic is just sitting under the trees and drinking tea, but a school treat is hunting for bugs and butterflies, and bumblebees and learning how they keep house. Why a school treat is ever so much more fun than just picnicing."

Out in Bombay, where the Scot has wandered, where the sun's beams fall like javelins in the bazaar streets, is another "school treat." In the far distance, the vultures are hovering over the Towers of Silence, where the Parsees expose their dead to these birds of carrion. The Parsee has learned from the canny Scot how to run factories, until bits of Bombay are as productive industrially as Glasgow. And from the sandy haired paleface of heather land, the Parsee has learned that the school treat is good for his black eyed bairns. In silks of many bright hues they start for the country side, but again it is one of the school treats, "that are so much better than a picnic."

So too, in Japan. Shaven headed little boys that look like pocket editions of solemn Bhuddist priests, until their faces crack into smiles; almond eyed little girls with bright colored obis showing iris and wisteria, cherry petals, autumnal maple leaves, chasing dragon flies along the narrow ditches of the rice paddies, all aglow with the flaming brilliance of the rice paddy, show how

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England's "school treat" has been woven into Japan's school system. And, it was the slant eyed of Nipponese, peering thro' a microscope that found the germ of the Black Death that for centuries had periodically ravished Europe.

One summer sunset, from Rigikulm, the long line of Alps was rose red with the Alpen glow. In the near foreground, a herd of goats were clambering unconcernedly around the rocky edge of a precipice. Up the other side came climbing another flock as nimble as chamois or goat. They were a nature study class from one of the wonderfully effective Swiss schools. The boys wore the green embroidered trousers of their valley. Each green mountain hat had its sprig of gray edelweiss or rosy Alpenrosen. The girls, who seemed to have made favorites of the brilliant blue Alpine gentians, were also in peasant costume.

"Yesterday we spent at Mortgarten" said the teacher. "The struggles of our ancestors with the Hapsburgs are not mere printed words on a page. We study history on the ground once red with blood spent for Swiss liberty. Today has been field work in botany. They are not only learning to use their eyes and to know the beautiful but they are drinking in a love of the hills and the wild that will never leave them."

These field excursions are characteristic of the Northern civilizations. Not alone in Holland, in Scotland, in the land of the Switzer, but in Germany and in Scandinavia. In Denmark, even the blind school children go into the magnificent beech forest known as the Royal Deer Park. Blindness may be even a help in learning the music of birds. The pathos of a life of darkness may make one of these a more effective missionary for the conservation of wild life.

Thus the children of Baltic Hanse towns have their swimming tramps. Hanover lads and lassies, with apple red cheeks, mingle studies of their moorland nature with those of the quaint mediæval timber houses of Braunschweig and Hildesheim. Copenhagen bairns take tramps to their wonderful museums, from Thorwaldsen's, to those of the kitchen middens with the clothing and even the women's hair nets, of the bronze period. Lubueck's lads

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sketch, in their sidewalk schools, such buildings as the old brick now used as a horseflesh butcher-shop.

———

These observations were made by a volunteer who undertook to gather data for the City Planning Committee of the Sacramento

Danish Children on a Nature Study Field Excursion, Royal Deer Park, near Copenhagen.

Some State owned railways in Switzerland give free fares to such excursions of school children.

Chamber of Commerce. How they became the basis of its slogan: "The child has the same right to be taught to read a roadside as a book" will be told in the second and final article. The data was gathered under a continuously increasing belief that the love of nature, the love of tramping, the love of turning to the country side for a recreation cheap enough to be enjoyed by all, was the antidote for the problems of increasing city congestion.

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For, if we can fill the plastic minds of growing children with thoughts of the beautiful world of nature, with the fascination of the myriads of wee beauties, more wonderful than a circus, we can so saturate them with the good, that no room remains for the morbid, the undesirable, the vicious. Let us teach them to read roadsides as well as books.

A Bird Court of Song

HECTOR ALLIOT
Los Angeles, Calif.

Strolling through the fields of Colorado one midsummer day in quest of interesting bird studies, my attention was arrested by a noisy chirping and twittering, and I found myself in the midst of a great flock of linnets, all apparently flying toward the same spot —a gully at the edge of the field. Cautiously approaching—camera in hand—I beheld a vast assemblage of the little red-heads, perched in long rows upon the strings of a barbed wire fence, crowding and pushing one another, each bird seemingly intent upon securing a point of vantage near a certain post.

For some time I watched their peculiar antics, endeavoring to learn why such an unusual number of the birds had congregated, and listening to their incessant chirping. The meeting was like a gathering of school children, or a picnic, each little one striving to make more noise and attract more attention than his fellows. Having witnessed several "bird courts" in New York and Pennsylvania, the meetings of crows, ravens, and others of the feathered tribe convened for the purpose of dispensing bird justice, I wondered whether these little linnets were following the example of their sable neighbors, the crows, and had come to try and punish some tiny offender. They fluttered nervously about like birds seeking a roost at twilight; now and then one would drop suddenly down upon another comfortably settled on a wire, and dislodge him, which would call forth a noisy protest and increased chirping and excitement. Gradually, however, the assemblage—now numbering a hundred or more birds—quieted down and the clamor became but a low, twittering murmur. Then followed an instant of perfect stillness.

At that moment a beautiful, brilliantly colored cock bird flew to the top of the fencepost which was somewhat higher than the wires. In full view of the entire assemblage he strutted about on the

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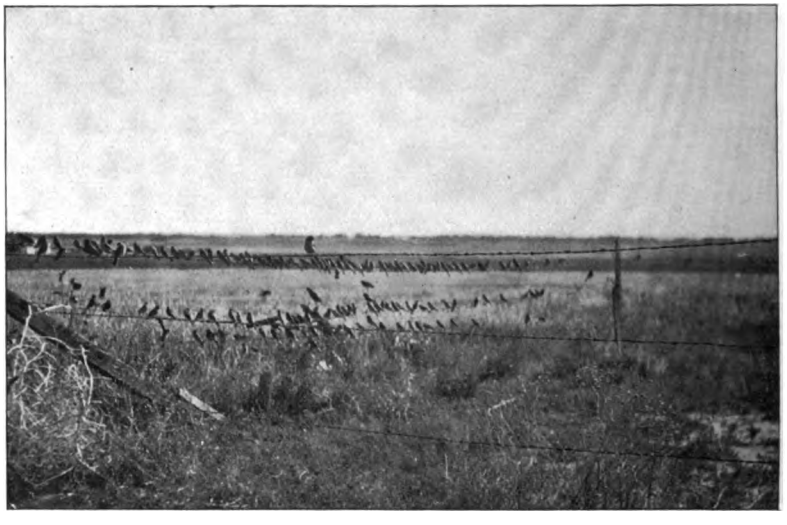
improvised stage, his wings flapping, his tail wide-spread, his little body trembling with excitement. The silence of the others was singularly impressive, it seemed that they awaited breathlessly an event of intense dramatic interest. Suddenly the throat of the cock bird swelled, and he burst into song—such a gush of rippling melody as never came from linnet's throat before. Now low as the rippling of waters, again shrill and sweet, the clear trills rose and fell, the tiny singer pouring forth his soul in an ecstasy of exalta-



The Linnets fluttered about like birds seeking a perch at twilight.

tion—the appreciative silence of the audience seeming to inspire him to wonderful accomplishment.

The desire to secure a photograph of the wonderful spectacle at this point outweighed my fear of disturbing the song festival, but so engrossed were the birds in the performance that the click of the camera did not alarm them in the least and I was fortunately permitted to continue listening to the marvelous soloist, until exhausted by his efforts he flew away to a perch on the wire, the others expressing their approval of his rendition in sharp twitterings of delight.

A second singer succeeded the first, and he was followed by still another, each going through the same performance of singing his

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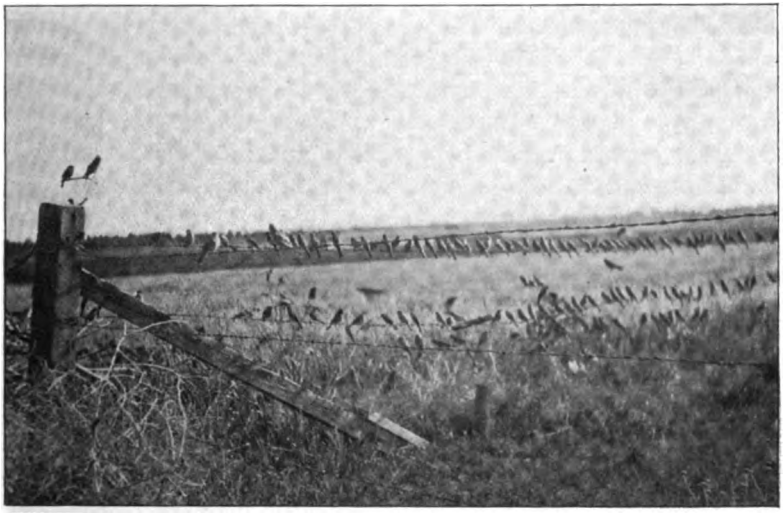
song for the entertainment of the assemblage; the appearance of each being the signal for absolute quiet on the part of the audience, and his retirement greeted with loud expressions apparently of joy or approval. For perhaps an hour the concert continued, and I finally left before the birds had dispersed, somewhat puzzled—I must confess—as to the object of the gathering. It scarcely seemed possible that these feathered minstrels had all assembled merely for the purpose of teaching the young ones the scales and



Suddenly the throat of the Cock Bird swelled and he burst forth into song.

cadences of linnet music. The presence of both male and female birds, the succession of artists—each appearing separately upon the stage—the very actions of the birds comprising the audience would almost warrant one in assuming that the little creatures had met together from a purely aesthetic motive, the desire to hear the great tenors and baritones of their tribe.

Migratory birds have frequently been observed collecting in great numbers preparatory to taking their flight toward warmer climes, whither an instinct not yet fully understood seems to unerringly guide them. The long flights undertaken by ducks, starlings, and many others of the feathered people including the tiny humming-birds, seem to be inspired by some inborn spirit

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that awakens in all members of the migratory species at about the same time—a blind, irresistible force, one of nature's mysterious workings—that impels them to move in a body to some remote spot. Birds also have been known to have held voluntary meetings on certain occasions other than these migratory gatherings, meetings called for a definite purpose, giving evidence of a power of independent thought and an ability on the part of the birds to communicate abstract ideas to one another.

Ravens, rooks, and crows have shown themselves possessed of unusual intelligence, probably only because their greater size and dark color makes them more easily observed than any of the smaller species. Practically all the meetings of birds classified under the name of "bird courts" have been held by some branch of that sable fraternity. These courts are generally convened for the purpose of enforcing certain well established laws of the feathered creatures, and are accompanied by so much noise and commotion that they frequently attract human spectators—the birds on such occasions being so absorbed with the business in hand as to be blind to the presence of onlookers who have approached the spot quietly. Such strong dramatic features mark these courts of justice that they have naturally attracted attention rather than any other bird assemblages, for the feathered culprit is often severely punished, and even put to death by his self-constituted judges.

It is a curious sight to witness one of these trials. One by one, and in small groups the crows gather at a certain spot that seems to have been appointed as the meeting-place—generally an old tree at the edge of a wood. When all have assembled—sometimes several hundred of the birds being congregated for the occasion—the old "King Crow" opens the proceedings by cawing solemnly, in a loud and strident tone. Then one after another the various witnesses or accusers give expression to their opinions, and at the conclusion of their statements pandemonium reigns; the whole neighborhood is filled with noisy cawings and flapping of wings, until people for miles around are aware that a crow court is in session. Sometimes belated birds fly swiftly toward the clamorous band, as if they had not understood fully where the meeting was to have been held, and their approach is loudly heralded by the scouts that have been placed on watch early in the proceedings. A brief silence follows the arrival of these late comers, as if someone were explaining what had taken place before they came, and then all

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break forth again into vociferous cawing, the noise becoming strident and incessant. Again and again, periods of silence ensue followed by riotous disorder.

Often it is the misdeeds of one bird alone that is the cause of all this turmoil. No man has ever been able to learn what the offence is, nor how nor when the prisoner was brought to the bar of justice in the tree at the edge of the forest. It is hard to understand too why the culprit comes and bows his head in shame and disgrace before his fellows, when it would seem that he might have so easily escaped by flying to some far-off spot out of reach of his accusers. The guilty crow appears, however, caws a weak defense with ruffled feathers and a most woe-begone expression, and has no more than finished when he is pounced upon by judge and witnesses who swoop down upon him with one accord, killing him instantly.

Such dramatic proceedings among crows have been witnessed again and again. Rooks and ravens have held the same sort of meetings. The punishment meted to the guilty one is not always so severe, however, as he is sometimes merely chastised, and presumably warned against again transgressing the laws of his people. I once watched two young, and evidently inexperienced ravens who had made up their minds to start housekeeping in the branches of a tree that it was quite apparent was unsound. Their elders remonstrated with them all to no purpose, and finally impatient at their wilful disregard of friendly advise, the King Crow called a court. After the usual long and noisy discussions part of the crows assembled flew to the tree and destroyed the nest that the persevering pair had almost completed, while others pounced upon the young offenders and thrashed them soundly. Curiously enough upon my visiting the spot some months later, I found that a severe storm had carried away the branch upon which the young pair had insisted on placing their nest, and had they been left in peace they and their babies would have perished. It may have merely been a coincidence, but it seemed that those wise old crows were possessed of an extraordinary intuitive knowledge that told them that the place was unsafe.

Sparrow courts for the trial and punishment of offenders have also frequently been noted, but the little creatures are so mischievious and pugnacious that their trials have neither the sobriety nor dignity of those of the crow family, and do not appear to be guided by so much intelligence. Swallows and martens too have

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their courts, the most important ones being those in which they congregate under a leader preparatory to taking their long flights, or unite their forces for mutual defence. One instance of this concerted action against a common foe came to my notice that was quite remarkable. A sparrow had taken possession of the nest of a marten, and seemed determined to resist all efforts to dislodge him. Safely ensconsed in the little mud house he vigorously defended himself against the owners attacks, and as his sharp beak—which easily can snip a piece from a person's finger—was the only part of him visible, he was able to successfully ward off their onslaughts. The martens after a time evidently called a court, for they gathered together on the church spire and a wise old bird set forth a plan that seemed to meet with universal approval, for they almost immediately flew away in groups apparently leaving the sparrow in peaceful possession. In a few moments, however, they returned each marten with his beak full of the sticky clay they use in building their nest, and—much to my astonishment—they flew one after the other in swift succession to the opening of the stolen house, depositing the mud at the entrance and packing it well together, until they had succeeded in completely walling up the nest, sealing the intruder within and burying him alive.

From far away Smyrna there comes a report of a most curious court of storks, which are deeply reverenced by the Turks and are protected by law, so that they become remarkably tame, building their nests upon the house-tops. A doctor was desirous of securing a stork's egg so he took one from a nest and substituted for it a goose egg. In due course of time a gosling was hatched, which seemed an object of great wonderment to his foster parents. Soon afterward the male stork was seen to fly away from the nest and hold an excited consultation with his fellows, and he before long returned accompanied by a number of other birds who set upon the innocent gosling and his guileless foster mother and put them both to death.

Linnet courts have usually been called only for defense, all the little creatures uniting in great emergencies to protect themselves against a common enemy, crows, cats, or hawks. Sparrows and swallows frequently join forces for the same purpose, a number of them often being seen in pursuit of a hawk in the air; and so persistent and concerted is their attack that the larger bird is usually put to rout completely.

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Since many persons can bear witness to the holding of meetings for the dispensing of bird justice and mutual aid, and it has been demonstrated in innumerable instances that these little creatures are possessed of an intelligence far beyond the promptings of mere instinct,—a reasoning power that leads them to take concerted action against a common foe, migrate in bodies, and assemble for various other purposes,—is it unreasonable to assume that they may at times meet together simply for recreation and pleasure?

Photography may be able to adduce proof that will convince us that these little feathered creatures are really capable of entertaining purely æsthetic emotions; and this record of the bird's court of song may give evidence of a spirit entirely apart from those natural instincts guiding them in the pursuit of material existence.

The 1915 Summer School of Agriculture and Country Life at the Massachusetts Agricultural College

E. H. FORBUSH

Despite the European War, the expositions on the coast and the fact that there were scarce two consecutive days of fair weather during the month of July, the four weeks Summer School of Agriculture and Country Life at the Massachusetts Agricultural College was larger and in general more successful than for some years past. The registration for the school itself totalled 157 and with those who entered for the special group of courses during the last two weeks it reached 175. It is interesting to note the occupations of the students, seventy-eight were teachers, seventeen students ten ministers, nine homemakers, seven farmers, four in business, three secretaries, two nurses, thirteen miscellaneous and thirty-two unknown. In view of the fact that the summer school was primarily intended for school teachers and has gradually been broadened to meet the needs of others, the heavy registration of rural teachers denoted that it is still serving its original purpose.

The general plan of the summer school is to have the regular classes, (four periods) during each forenoon, except Saturday, to have class discussions or field trips Monday and Friday afternoons, laboratory work and organized recreation Tuesday and Thursday afternoons, an afternoon excursion on Wednesday and an all-day excursion on Saturday. Tuesday and Friday evenings of each week are devoted to social activities for students and faculty. The

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almost invariable daily shower or storm during the month interfered somewhat with the scheduled program but this was largely adhered to. The excursions for the first week were necessarily abandoned. During the second week the Wednesday afternoon excursion was to "The Notch," Bear Mountain and a seven-mile tramp over the range to Mt. Holyoke and a five-mile tramp from there to Hadley, conducted by Erwin H. Forbush, of the Extension Service. On Saturday the all-day excursion was to historic Old Deerfield with its museum of antiques, its basket making and its

Organized play, "Hunter and Fox."

many other points of interest and was in charge of Professor W. D. Hurd. The following week the Wednesday excursion was to Mt. Sugarloaf and was in charge of C. J. Maynard. The Saturday excursion in charge of F. A. McLaughlin, was to Mount Holyoke College, one of the paper mills at Holyoke and to Mt. Tom. No excursion was conducted on the following Wednesday but on Saturday an all-day "hike" to and over Mt. Toby was taken by a large number under the direction of Prof. A. V. Osmun. On Thursday evening of each week an outside speaker of prominence is secured. These evening lectures were as follows: July 1, Prof.

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Dallas Lore Sharp of Boston University who gave an interesting and humorous talk regarding his experiences in both city and country; July 8, "Rural Health Service," by Dr. Frank Overton, Sanitary Supervisor of the New York State Department of Health; July 15, "Bird Study and Protection" by Edward H. Forbush, State Ornithologist; July 22, "Personal Reminiscences of a Bird Man," by Earle L. Ovington, Ex-Aviator, West Newton, Mass.

(A) And now as to the school itself. The various courses offered and the registration in each were as follows: Soil Fertility,

Class in Beekeeping.

37; Breeds and Types of Livestock, 11; Modern Dairying, 12; Dairy Laboratory, 15; Poultry Breeding and Management, 28; Farm Management and Farm Accounts, 19; Farmers' Exchanges, 12; Fruit Growing, 32; Practical Gardening, 12; Amateur Floriculture, 28; Garden Flowers, 25; Dendrology, 9; Silviculture, 5; Garden Making, 21; Civic Improvement, 16; Inorganic Agricultural Chemistry, 8; Organic Agricultural Chemistry, 7; School Demonstration Material, 11; General Botany, 11; Cryptogamic Botany, 2; Bird Life, 27; Insect Life, 7; Methods of Collecting in Entomology, 2; Beekeeping, 23; Foods and Household

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Management, 33; Cookery, 14; Practical Nursing, 20; General Home Economics, 13; Home Economics for Rural Schools, 9; Collection of Home Economics, 4; Design and Practical Arts, 50; Organized Play and Recreation, 35; Plays and Pageantry, 20; Home and School Gardens, 13; Coöperation in Agriculture, 2; Economic Aspects of New England Agriculture, 5; Small Fruit Growing, 25; The New Rural Church, 11; Rural Community Planning, 14; Rural Organization, 13.

It will be seen from this summary that the ten most popular courses, as judged by registration, were, in order, Design and Practical Arts, Soil Fertility, Organized Play and Recreation, Foods and Household Management, Fruit Growing, Poultry Husbandry, Amateur Floriculture, Bird Life, Small Fruit Growing and Garden Flowers.

Readers of this article will doubtless be interested to learn what type of persons registered in those courses most closely allied to nature study. In the course on Bird Life, which was conducted by C. J. Maynard, the well known ornithologist, of West Newton, Mass., there were 16 teachers, two students, one artist, one secretary and seven whose occupations are unknown. In the Home and School Garden Course there were nine teachers, one homemaker, one minister, one student and one unknown. In the Forestry Course there were six teachers, one nursery inspector, one student and two unknown. In the course dealing with Plant Experiments and School Demonstrations Material, there were four teachers, one student and five unknown. In the Botany Course there were four teachers, two ministers, one secretary, one student, and five unknown.

(B) The Tuesday evenings during the school were devoted to a general social good time including dancing; on Friday evenings special events were schedules which included a "Peach Blossom Party," an Indoor Track Meet at which many novel events were scheduled, a Poverty Party and on the last evening which was a reception to the faculty, a number of short one-act plays were given.

Much of the class work was conducted out-of-doors and the accompanying illustration will give an idea of some of its phases.

As a closing feature of the summer school, there is held each year a four-day conference on Rural Organization. The plan of this conference is to hold section meetings during the forenoon devoted

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to specific subjects and joint meetings of interest to all in the afternoon and evening. There were sections this year devoted to civic improvement, rural education, rural sanitation, library work, camp-fire work, boy's and girls' club work and women's work. The work was devoted to certain general subjects each day; for instance the first day was given up to actual community achievements, and the succeeding days to town organization, county organization and state organization, respectively. This conference closed what was probably the most successful summer school yet

Class in Market Gardening.

held. The views of the students themselves, are adequately depicted in the following resolutions by the school:

Resolved, That we express our gratitude to the Commonwealth for the provision made for the maintenance of the Summer School and our desire that a like opportunity be offered to others in coming years.

Resolved, That the courses offered in the Summer School are of inestimable value to many who would find it impossible to avail themselves of such instruction at any other time.

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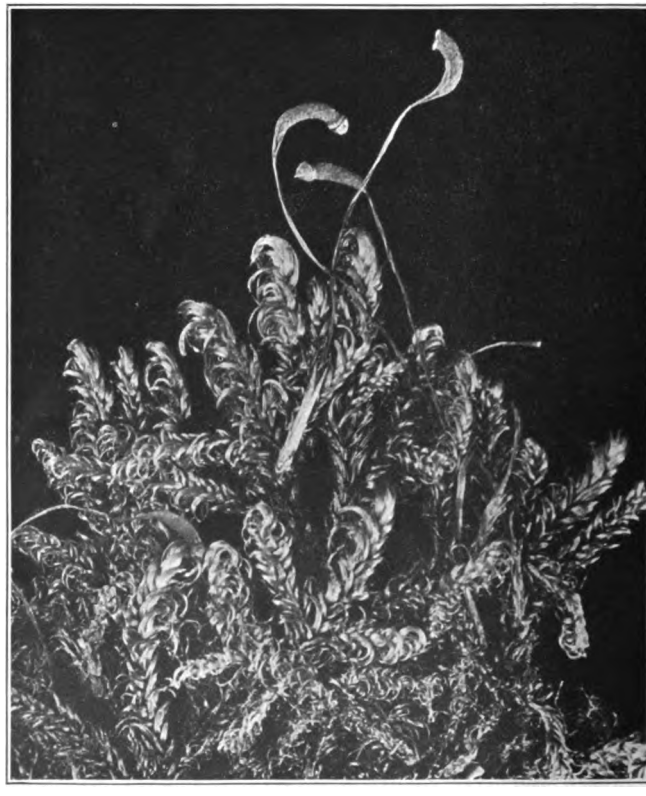
Resolved, That we tender our hearty thanks to the Officers and Instructors who have so generously put time and effort into making the courses interesting, practical and instructive.

Resolved, That we appreciate not only the educational advantages that have been offered but also the spirit of good fellowship that has prevailed as a result of the carefully planned social activities.

Some Common Mosses III—Three Hypnums

A. J. GROUT

In the two previous articles we have considered mosses in which the fruit (sporophyte) develops from the end of the main upright stem. Such mosses have been called *acrocarpous*.



Drepanocladus uncinatus x5, dry (Hypnum uncinatum)

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Hypnum Haldanianum x5, dry

Many of our mosses, however, develop the sporophyte from lateral buds along a creeping or trailing stem. These have been called pleurocarpous.

This division of the mosses is old fashioned and not technically a good one, for it does not divide the mosses according to their natural relationships. It is, notwithstanding, a very convenient classification for a popular article, as the distinctions are so apparent in nearly all cases.

For the subject of this article I have taken three common mosses belonging to the old genus *Hypnum*.

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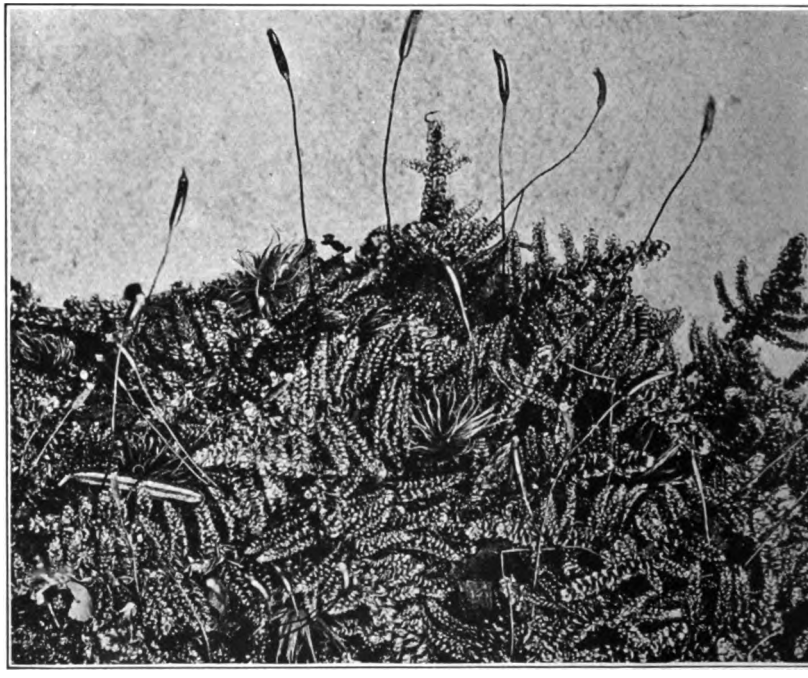
Hypnum imponens Hedw. (The Pinnate Hypnum) is a very attractive moss, nearly always found covering rotting logs or wood with its bright green mats. It is found in moist shady places nearly everywhere in eastern Canada and the northeastern



Hypnum impaneus x 2 (?)

United States. It is abundant on Long Island within the limits of New York City.

The Pinnate Hypnum may be identified by its nearly regular pinnate branching, reddish stems, leaves curved to one side (secund), usually curved downwards and more or less hooklike at the ends of the stems and branches, and also lacking a midrib; and by the nearly erect capsules, cylindrical but slightly curved. There are several other species of *Hypnum* that are closely related to *H. imponens* and much resemble it, but a moss which grows on

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rotting wood, has red stems and looks like the accompanying photographs can pretty safely be referred to this species. The capsules ripen from late autumn through the winter.

Hypnum Haldanianum Gerv. is another species common on rotten logs and wood. The capsules are much like those of *H. imponens* and ripen at about the same time, but the branching is irregular, the leaves straight and evenly arranged about the stems.

Both the preceding are still classed as *Hypnum* but our next

Stem end of Hypnum impanens x7

Hypnum uncinatum Hedw. is now put in the genus *Drepamocladus* because (not present in *Hypnum* proper) its leaves have a strong midrib, easily visible with a strong lens. This species grows on wet earth and stones in shaded places. It is frequent in most localities in the North East and very common in the mountains. The branching is irregular and the leaves so strongly secund and hooked at the tips of the stems and branches that I have called this the Hooked Moss. The hooked moss is extremely variable in size and there are numerous closely related species. It is distinguished from other species of *Drepanocladus* by its rather long, slightly curved capsules and strongly wrinkled (lengthwise) leaves. The capsules mature from spring to summer.

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A caution with reference to comparing specimens with enlarged photographs may not be out of place. The enlargement helps to bring out minute characters but is apt to mislead as to general appearance unless one is careful to make allowances. A strong reading glass on the sepcimens or a reducing glass on the photographs will help.

The Effect of Color on the Thistle Butterfly

An experiment by the Girls of West Vernon School, Los Angeles

EDNA KINCAID, A7

I put some almost black caterpillars of the Thistle Butterfly (*Pyrameis cardui*) in a pearl-grey box. In a few days they had turned light grey. The spines and stripes on the caterpillar matched the box exactly. It seemed too great a change to be accidental. So I decided to try an experiment to see whether the color of the surroundings had anything to do with the color of the caterpillar.

I lined seven boxes with pearl-grey, pink, lavender, crushed apricot, blue, green, and black paper, one box with each color. I then put four caterpillars in each box, putting one of the light-grey caterpillars in the black box. I fed them malva, the plant on which I found them.

In two days the light-grey caterpillar had black spines and in three days his body darkened. All of the caterpillars in the black box turned almost black and made black chrysalids with very little gold on them.

Those in the green box turned as dark as those in the black box, but the chrysalids were dark brown instead of black. The caterpillars raised in the blue box had brown bodies with bluish spines. The chrysalids were brown with gold spots.

The caterpillars raised in the lavendar box and those raised in the pink box changed spines and stripes under the spines to nearly the color of the box. These chrysalids were light tan with many gold spots. The chrysalids in the pink box were almost all gold.

But the best match of all was in the crushed apricot box. The spines and stripes of the caterpillars were a dead match for the box. The chrysalids were the exact color of the box with two rows of gold spots.

The butterflies were most disappointing. We took careful notice of them as they came out, and saved and mounted as many

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as we could. We also caught ten out doors. We could not see that those raised in the colored boxes varied any more than did those caught with the net.

Nature-Study in a Rural School

MABEL L. GRANT

Nature-study has been the topic of so many lectures and magazine articles that it has ceased to be a new subject, and yet it is a subject that can never grow old. As nature herself takes on new forms of life from day to day so should the study of these Nature forms and their changes awaken new interest and new sympathies.

There was a time when it seemed that I could not teach Nature-Study because there was no subject matter at hand; but I have come to realize that the out-of-door world furnishes all the subject matter that one can well use. Of course one needs reference books to help identify specimens and I would highly recommend the leaflets sent out by the New York State College of Agriculture and Comstock's "How to Know the Butterflies." It is helpful and interesting to refer to these while studying the life history of moths, butterflies and other insects.

When I began to teach nature-study seven years ago I gave out a certain amount of work for the children to learn and pretended to have a recitation once a week, but I never tried to connect, nor to have the children connect the facts learned with the real life of the specimens studied. As a result the subject had no interest for either the teacher or pupils.

One time, several years after my first year's experience with the subject, I found my class and myself much interested in some specimen that had accidentally come before us. After that I made an effort to study the specimen with the written work and from that time nature-study became a reality and interest in the work grew very rapidly.

When school work began in September, 1911, I had sixteen pupils and all except three were ten years old and under. Early in the fall we decided to make a collection of nature work. All specimens were studied, the keyword being recognition in the first three grades and adaptation in the intermediate.

At the end of the year the work was sorted, mounted and labelled by three different grades. The sixth grade had a collection of

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ninety-six different kinds of seeds and a collection of insects numbering over sixty. A locust exhibit showed the leaf scars, leaf buds, leaves, flower buds, flowers, bark, wood, pods, seeds, and roots bearing the nodules. A corn exhibit showed a young corn plant, the two kinds of blossoms, the grain and thirty different products made from corn.

In the fourth grade, two pupils each ten years old, mounted specimens of trees. One collection consisted of leaves, bark, and cones of the evergreens found in this vicinity. Six nutbearing trees were represented by blossoms, leaves, bark and nuts; several fruit trees by blossoms, leaves, bark and seed. The fourth collection represented several common shade and forest trees. A miscellaneous collection consisted of the tent caterpillar in all stages of growth and its tent; tadpoles from one week old to a fully developed frog; fungi, mud wasp's nests, snail shells and a squirrel's nest. There were also several turtles' eggs, a crayfish, and two hornets' nests, one, showing the outside and one the inside and some of the hornets.

In the second grade were three boys, each eight years of age. They had a collection of grains, one of grasses, one of plants, one of weeds and one of clovers, and they took as much pride in mounting and marking them as the older ones did.

All the children enjoy this work very much because it is real live work and they can see the results of their labor. Being interested in this they become interested in school work in general and consequently do better work.

So many teachers have said to me it would be impossible for them to do such work because they do not know the specimens and would not know how to go at it. These difficulties confronted me but I have found, as these teachers would, that there is a world of truth in the old adage, "One learns to do by doing."

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Editorial

A new text in nature study* is worthy of more than passing notice, especially, when it incorporates a national idea on the subject. In the first chapter the author says "Nature Study is more than formal science. The latter is rigidly disciplinary, training hand, eye, and intellect, at the same time equipping the mind with knowledge useful in the affairs of life. Of Nature-Study, as we seek to teach it, all this can be said, and more." "The discipline is not always so obviously rigid; it is gentler, but none the less real. There can be no doubt as to the training of hand and eye, nor sometimes also, of hearing, taste and smell. And the knowledge gained is always mind enriching, i. e., it constitutes culture, and it is not infrequently practical as well. But beyond discipline and beyond the storing of the mind with facts, we aim in our school studies at developing a cultured appreciation of nature, a sympathetic recognition of her æsthetic aspects—that is a love of the open enriched and enlightened by knowledge."

The book includes many lessons on animals and plants including the whole gamut of both kingdoms, and also a considerable treatment of geography and meteorology. Throughout the author insists on a first hand contact with materials. He gives many suggestions of ways, and means and outlines a course of study.

The striking thing about the book, however, is its frankly scientific style and its scientific form of subject matter. It is not a dilution of science to meet the comprehension of the child; rather a selection of science with reference to the child's interests and abilities. Then it is science *and more*. The scientist has been free to criticize nature-study as a perversion of science or as so weak an attenuation as to be useless or worse. And it may be occasionally justly open to such an attack. Though such a book as this, if it embodies a national practice, certainly shows such criticism to be in the main unjust. Now comes the counter charge that science teaching is incomplete, lacking cultural and æsthetic values that it might well possess, ought to possess in any efficient educational scheme. Dr. Needham's book reviewed in this issue aims to add these elements to the agriculture course. These mutual criticisms are helpful. They tend to produce better balanced science instruc-

*The Aims and Methods of Nature-Study, a Guide for Teachers, John Rennie Lecturer and Assistant to the Professor of Natural History, the University of Aberdeen, etc.; 352 p. Warwick and York; $1.10.

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tion, instruction with more human content, conscious ethical aims and æsthetic appreciation and a nature-study with more stamina. This is a scientific age but in no age can cold facts function most efficiently as motive power to human advancement until coupled up with a sense of harmony we call beauty and impelling sentiment.

Book Reviews

Natural History of the Farm. James G. Needham. Pp. 348. Comstock Publishing Company. $1.50.

This book is the result of, and the text in, a course given by Mr. Needham to freshmen students in an attempt to familiarize them with the farm environment and something of the significance of the various factors from the natural history point of view. The work has been done largely by out-of-door excursions, the class meeting in an outdoor auditorium for the necessary lectures. It is one of the most suggestive nature-study books that can be put into the hands of a teacher for it is not only full of suggestive topics of study, but also gives many directions as to the method of conducting work. Moreover, the work is arranged seasonally. After the introductory chapter on Mother Earth, there follow chapters on the wild fruits of the farm, the nuts of the farm, the farm stream, with a typical map, the fishes of the farm stream, pasture plants, the edible wild roots; and so the topics continue through some 48 chapters, and there is an appendix on outdoor equipment. Just as an illustration of the unique method of handling the subject matter, the contents of chapter 11, on the fuel woods of the farm may be outlined. There is a map of the farm wood-lot; an apt quotation from Whittier's Snowbound opens the chapter; the important place of fire in the economy and evolution of the savage is noted; the various qualities of fire wood are reviewed; and there is a discussion of the ways in which different types of camp fires are built, with illustrations to show the methods of building. There are suggested then a number of exercises to be conducted in the wood-lot, testing out the burning qualities and heat-giving powers of the various woods. The Indian method of making a fire with the fire stick is shown, and described.

There are several other chapters on various phases of the farm trees, such for instance, as the insects that attack them, the various kinds of trees and the uses to which the wood may be put upon the

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farm; and chapters on the artistic appreciation of trees, such as, chapter 32 on trees and the early summer landscape. On the whole, the book is to be recommended as an exceedingly valuable addition to the nature-study library of any school or teacher.

Mammals of Colorado. Ed. R. Warren. xxiv + 300. G. P. Putnam Sons, New York.

This volume is a scientific description of the various mammals of Colorado, but in it there are a great many notes on the natural history of the forms that will be particularly valuable to the teacher in many of the western states. The book is admirably illustrated, and only one who has tried to obtain pictures of the mammals in the wild can appreciate the good photography that the author has accomplished. As in many of the western states, the cattle men of Colorado have been pestered with the wolves and coyotes; the pages on the habits of these animals are exceedingly interesting. The statement is made that the cattle men estimate their loss from these animals at about 10%. Even adult animals are killed, though the calves and colts and lambs suffer most. In a single year, from July, 1903, to June 30, 1904, the author states that bounties were paid on 19,514 coyotes. In 1907 in the valley of Green River, in Wyoming, twelve wolf dens were discovered and 70 pups killed by the ranchers and forest rangers. In the same year in these mountain states, the total of 1723 wolves were killed. All of this gives some idea of the abundance of the animals.

Laboratory Studies in Mallian Anatomy. I. W. Wilder. Pp. xi + 156. P. Blakiston's Son & Co. $1.25.

This is not a book that would appeal to the nature teacher, but might be of service to the high school instructor, though more properly a guide for college work. It gives in clear language the directions for the study of several mammalian types, indicating briefly also the methods of preparation of some of the more important histological tissues.

Introduction to the Study of Fossils. Hervey W. Shimer. Pp. xiv + 450. Mac Millan Co. $2.40.

This is primarily a college text. Every student of animal life, however little his studies may take him into the scientific complexities, will enjoy turning the pages of this, at least to have his imagi-

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nation stimulated by the numerous cuts. There is no more marvellous story than that portrayed by the fossil series that the palæontologists have succeeded in getting together in the various museums. The fairy stories devise no more incongruous animals than actually lived in past ages on the earth. The plants are no less interesting, even if they are less strikingly different from the present plant life. The book takes up the various plant and animal groups in order, gives enough of the anatomy of present day plants and animals so that even the beginning student can appreciate the significance of the various fossil types discussed. The book is well written. Necessarily it is condensed but there is given at the end of the book an excellent bibliography which will enable one to follow up any particular line of interest with considerable ease.

Spencer Fullerton Baird, a biography by William H. Dall. Pp. xvi + 462. J. B. Lippincott Co. $3.50.

This book will go on the shelf of the American biologist along with the life of Agassiz, for Baird and Agassiz were two of the most important personal factors in the development of biology in America. This biography is admirably written by one who was intimately associated with Professor Baird, and who writes with discrimination and sympathy. Baird was the second secretary of the Smithsonian Institution and the organizer and the first commissioner of the United States Commission of Fish and Fisheries. Every American biologist who has been to Woods Hole will remember the great granite boulder bearing the tablet to the memory of the father of the Commission the chief station of which is located in this Massachusetts town. The book contains many excerpts from Baird's letters which give an insight into the sturdy loyal character of the man; they also give a history of some of the important practical phases of biology in this country. As a young man, Baird was professor of Natural History in Dickinson College. While here, his biographer says "he instituted a series of outdoor rambles on Saturday afternoon during which collections were made of objects of natural history, and the boys gained a practical knowledge from nature herself of great value. This of course is very customary now, but was a startling innovation at that time," (1846). Baird had a knack of gathering about himself always groups of young men to whom he was a source of inspiration. His success as head of the Fish Commission was in no small measure

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due to this trait; and under his administration the Commission did a great deal of exceedingly valuable scientific work. It is impossible in a paragraph to review a book of this sort. All that can be done is to indicate its great interest and express an appreciation of the valuable contribution that it makes to the history of American Science.

Introduction to Botany. Bergen & Caldwell. Pp. vii + 368. Ginn & Co. Without Key, $1.15, with key, $1.40.

This is an attempt to write a book on botany from the standpoint of the student's interest, rather than from the standpoint of the systematist and specialist. That the attempt has been measurably successful is evident from the fact that it has been so widely adopted. After the introductory chapter, there is a chapter on the plant as a working machine; and in the succeeding chapters three to seven, this discussion is continued in some detail, taking up in succession roots, plant food, the stem and the leaf, and the special functions of the former. Chapter eight is devoted to forestry; chapter 12 to plant breeding; chapter 14 to bacteria; all of chapter 16 to fungi and funguous diseases of plants; chapter 19 to plant industries and chapter 20 to weeds. The remaining chapters are devoted to the more customary topics treated in the usual botany. The book is published either with or without the Key and Flora. All of the illustrations in the book are new, most of them being photographs of drawings made particularly for this volume.

First Year of Science. John C. Hessler. Pp. xiii + 484. Benjamin H. Sanborn & Co. With Laboratory Manual, $1.45. Without Laboratory Manual, $1.25.

First year science is still in the experimental stage, and it is well to have a variety of texts that we may try them out and see which is best adapted to the situation. This book is apparently a combination of several brief treatises including the more important topics of physics and chemistry, a single chapter on rocks and soil, another on plants, another on animals, three on physiology, and one on sanitation. Turning to the chapter on animals, the topics treated are practically those of a brief systematic zoology. It is difficult to see why it should be taken for granted that the first year high school pupil is interested in the structure of hydra,

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sponges, earth worms, fresh water clams, lobsters, skeletons of fish and their internal anatomy, unless because that sort of thing has been prescribed for the high school zoology by many texts. There is certainly nothing original in this chapter in the method of treatment. It would be impossible to do laboratory work covering the forms studied in the time that can be devoted to the one chapter. It would be impossible to even do more than take a cursory glance at preparations and prepared specimens. In the chapter on the human body, there is again nothing novel in the treatment. The pages might be culled from almost any elementary text on human physiology. This, of course, embodies one notion of first year science; that we should undertake to give in the first year samples of a number of sciences that the pupil may come to know his interests in order that he may follow in the later years the particular science that appeals to him. With this test as a basis, I should be reasonably certain that very few pupils would go on with their zoology. In the chapters on chemistry and physics, greater use is made of things in the child's environment that appeal to him. And yet even here the headings of paragraphs give one the impression that an attempt has been made rather to present physics than to stimulate a comprehension of the child's surroundings.

The High School Age. Irving King. Pp. 233. The Bobbs Merril Co. $1.25.

This book is a very good summary of a number of important recent books and articles on the child during his pubertal and adolescent period. There is appended to each chapter a bibliography of the sources of the chapter. The aim of the book is given in the introductory chapter briefly as follows: That there is a deal of retardation and unnecessary elimination of pupils in the early high school years; that this is in a measure due to our lack of comprehension of the physiological conditions and the accompanying psychic states of the boys and girls during this revolutionary period. The book undertakes to make clear what the changes are and what their significance is to education. One is impressed in reading the book quite as much with the paucity of information at our disposal at present as with what we do know. If you bring to the book some definite question, such, for instance, as what do we know of the adolescent period that will help us in settling the problems of

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science instruction in the high school, you leave it little wiser on this particular topic. This is no adverse criticism of the book, but simply of our state of knowledge on this entire phase of child development. The book is eminently readable and would be immensely profitable to parents as well as to teachers. While the development of the sex impulse is fundamental during these years, the author believes that it is more or less completely a hidden spring of the changes that are going on and that the factors that affect school work are mental rather than physiological.

News and Notes

Professor Raymond C. Osburn, formerly of Columbia University, is now located at New London, Conn., on the faculty of the Connecticut College.

Professor Cornelius Betten, formerly with Lake Forest College, Illinois, is now on the faculty of the New York State Agricultural College, Cornell University.

Miss Adeline Thurston, Cornell '15, has charge of the nature-study classes in the State Normal School, New Paltz.

The Dayton (Ohio) Normal School has completed plans to introduce a Nature-Study course.

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VOL. 11 NOVEMBER, 1915 No. 8

The Organization of Nature-Study

JOHN DEARNESS

The time-honored subjects of the public school curriculum seem, for teaching purposes, to have been easily organized and at the first in nearly the same way in which they are now pursued. In view of this fact, or what seems to be fact, the question is asked: Why does the organization of Nature-Study make so little progress or no progress? The question indicates that the questioner probably does not understand the nature of Nature-Study. Increase of knowledge and development of mental power may closely interrelate but the expert student of education easily distinguishes them. Now knowledge subjects, history and arithmetic for example,—could be organized, probably were organized, along lines of chronological or logical sequence, without regard either to the circumstances of the learner, or the methods of the teacher. But in nature-study, where the choice of material must be conditioned upon the environment and experience of the learner, and the efficacy of its use upon the methods employed by the teacher, it is impossible to devise a graded course of study like the one in arithmetic or history, suited to the schools of a whole state. The relations of fractional quantities have always been, will always be, considered less elementary than the corresponding relations of integral quantities but for the purposes of nature-study it cannot be said that the study of a geranium is simpler or more difficult than the study of the moon or that either is suited to the second grade and the other to the fourth. That was a fertile thought of Dr. L. H. Bailey's—the one in which he stated in effect—that when the teacher is thinking more of his subject he is probably

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of Education, E. V. Kilpatrick or other speakers, the School Garden Association.

FRIDAY, DEC. 31, 10:00 A. M.

General Topic—Problems in the Organization of Nature-Study and Preparation of Teachers.

Speakers, O. W. Caldwell, M. A. Bigelow, J. A. Drushel, R. E. Wager, C. F. Hodge.

The papers in the December number, 1915 and December, 1914, will be the basis of the discussions.

LUNCHEON

Friday noon at 12:30 an informal *luncheon* will be served at the Crittenden Hotel. The price will be 50c per plate. All members and friends of the Society will be welcome. The occasion will give opportunity to renew acquaintances. There will be an after dinner discussion of *Nature-Study Needs and Prospects.*

3:00 P. M.

General Topic—Relation of Vocational and Industrial Education.

B. M. Davis, (Ohio); Fred Ullrich, (Wis.); E. B. Balcomb, (S.C.) C. A. Mathewson, (N. Y.).

Nominations are as follows:

For President (vote for one)—L. H. Bailey, N. Y.; M. A. Bigelow, N. Y.; B. M. Davis, Ohio; Otis W. Caldwell, Ill.

For Vice-Presidents (vote for five)—L. H. Bailey, N. Y.; M. A. Bigelow, N. Y.; O. W. Caldwell, Ill.; B. M. Davis, Ohio; C. F. Hodge, Ore.; F. L. Holtz, N. Y.; S. B. McCready, Ont.; C. A. Mathewson, N. Y.; Alice J. Patterson, Ill.; Gilbert H. Trafton, Minn.

For Directors (vote for five)—L. H. Bailey, N. Y.; J. A. Drushel Mo.; C. F. Hodge, Ore.; C. H. Robison, N. J.; S. C. Schmucker, Pa.; Susan B. Seipp, D. C.; W. J. Stevens, Mo.; Gilbert H. Trafton, Mo.; R. E. Wager, Ill.

Secretary-Editor—Elliot R. Downing.

Members not planning to attend the meeting will please send ballots at once to the secretary.

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Training Teachers to Teach Nature-Study

ALICE J. PATTERSON
Normal, Ill.

If nature-study and elementary science ever fulfill the mission where unto they are called we must have teachers in our elementary schools who are fitted to do effective work in these subjects. We need teachers who have the nature-study point of view, the nature-study spirit; teachers who have a working knowledge of nature-study material, and are imbued with the nature-study method.

While occasionally teachers are found who without special training do excellent work in nature-study because they seem naturally to possess the requisite qualification, the fact remains that the great majority of teachers who undertake the work need some special preparation. The problem of training these teachers falls largely upon the instructors of nature-study in our colleges and normal schools.

In my observation of grade teachers I have found the following difficulties in the way of effective nature-study teaching: (a) the apparent impossibility of the teacher to get away from the formalism of the ordinary school subject; (b) the desire to teach facts, to give information instead of directing the pupils to see, to think and to act independently; (c) a deplorable ignorance of the nature-study material in the environment of the school and the helplessness of knowing how to get acquainted with it; (d) coupled with the last the absolute dependence upon books and authority in the preparation of lessons; (e) encouraging children to come to conclusions without sufficient data, to carry on a game of guessing which is interpreted as thinking; (f) the inability to recognize that some things must be told.

In the light of the above obstacles to good nature-study teaching it seems evident that in preparing teachers to go out into our elementary schools we must give attention both to material and method. In a method course for prospective teachers it seems wise to give at the outset considerable time to a study of material even if the students are pretty well grounded in the facts of botany, zoology, and physics. One value of this work is that the students form the habit of going to nature objects and phenomena for information, and of using books simply to direct observation, or to

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supplement their first hand knowledge. Another value of this hand to hand contact is that through it the students catch the nature-study spirit. One of the joys that comes to the teacher of these students is to watch the transformation that takes place, to see one after another of these would-be teachers awaken to the world of interest about them, to an appreciation of the common things of daily life. When a student receives this baptism of the nature world then we know that nature-study teaching as far as she is concerned is likely to be in safe hands.

A third value of the study of material is that the students, by imitation, are getting some idea of the nature-study method. However, there comes a time when direct attention to method should be given in order that the student may become conscious of the steps that they take in covering a series of lessons comprising a unit. Analysis of such a series shows usually three distinct phases: first, the concrete which includes observation,investigation, experimentation and creative activity; second, the informational which includes knowledge gained at first hand or upon authority; third, the socializing which includes not only the broadening of the student's horizon but the relation of the topic under consideration to history, to literature, or to the life of the community.

In training teachers the children who are to be taught must be considered as well as the material and method. The students should in some measure get the viewpoint of children. They should realize that they cannot teach trees, or birds, or gardening to primary children as they would to boys and girls of intermediate or grammar grades, that in each case freedom and individual initiative must be allowed so that as far as possible the problems raised will be those of the children not of the teacher. Here is where the so-called model lesson has a place.

The model lesson may be written after it has been taught and the reaction of the children secured, so that it may with some degree of security be used by another teacher who wishes to teach the same material to a similar grade of children, or it may be an oral lesson taught in the presence of the students. The latter is no doubt of greater value than the former since the student not only witnesses the presentation of the lesson by the teacher but the questions, the responses, and the interest of the children. I am of the opinion that the observation of the isolated model lesson

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such as we occasionally have in our training schools is of little value. Few nature-study lessons can be finished at one sitting. A series in which the student has an opportunity to watch the children in their observation and the solutions of their problems is, I believe, much more valuable.

An illustration of such a series of lessons will make clear what I mean. The eighth grade in our training school has recently completed a series of lessons on the box elder bug (*Leptocoris trivittatus*) Altogether there were four lessons. However, the lessons did not occur on consecutive days so that a period of about a week and a half elapsed between the first and last lesson.

The first lesson was a visit to a box elder tree on whose trunk was a large number of the insects in various stages of development. The children were told to look at the insects a few minutes and then ask questions or tell facts. Several facts were stated but the chief problems were: Why was there such a mass of the insects on the tree; and did the difference in size and color mean a difference of age or different kinds?

To solve the problems the children were asked to place in some glass jars, brought for the purpose, a number of the smaller insects. A few box elder leaves were put into the jar and the children were told to watch for results.

At the beginning of the second lesson a number of the children were ready to report that the small red insects had changed into black and red adults. The fact that they shed their skins in the process of changing had also been observed. The differences and resemblances between the immature and the adults was then worked out by observation and at the same time the life history stages as far as they could be worked out were noted. The children were asked to keep eyes open and report all the places in town where the box elder bugs were found.

The third lesson consisted of reports of the places where the insects had been found and a discussion as to whether or not we should consider them pests. Having decided that they were, at least, a nuisance, the next question was what could we do to lessen their numbers. Experiments in spraying were tried and were found effective.

The fourth lesson was a summary of the facts that had been learned from the concrete work, the observation and experimentation; and a discussion of the advantage to the entire community of destroying the insects.

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The lessons proved valuable to the student observers, for while the teacher in the organization of her material had in mind all the problems worked out, yet the lessons were presented so that the children raised the problems for themselves and in most cases succeeded in solving them by following the teacher's suggestions. Another bit of worth while training came with the fact that a considerable period of time was required to solve some of the problems.

Training to Teach Nature-Study in Ontario

By JOHN DEARNESS, M.A.
London, Ontario

In response to the Editor's request for a symposium on the Training of Teachers for the teaching of nature-study I have to state that the seven Normal Schools of this Province of Ontario are similarly organized and centrally directed, hence what can be said of the training in any one of them applies in a general way to the training in all of them.

In the prescribed schedule of lessons five lessons per week are allotted to the group—physics, chemistry, biology, geography and hygiene—that is on the average an hour a week to each from the first of September to the first of June. The training is completed in one term. Nature-study and Agriculture are not mentioned in the list of main courses but they are supposed to be worked in on the time of this group sufficiently to deal with the following topics:

"The character and scope of nature-study; its relation to formal science; its correlation with other subjects.

"The choice of material for lessons for pupils of different grades, and for varying conditions in rural and urban schools; uses and limitations of books, pictures, models, collections, etc., supplementary materials such as stories, literature, etc.

"Nature-study as a method; special characteristics of a typical nature-study lesson; uses and limitations of records of observations; directions for conducting school excursions. The study of special topics dealing with materials of nature-study and illustrating methods of presentation in all grades of public schools, the topics to be typical and to be selected from various grades and departments of the Public School course of study; the relation of feeling to knowledge in nature-study work.

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"The purpose of school gardens; school gardens as a phase of nature-study work; their relation to agriculture and horticulture; the discussion of the purpose and possibility of the study of agriculture and horticulture in urban and rural schools; care of school gardens. Practice in planning and plotting a garden; planning school grounds for tree planting in accordance with the principles of landscape gardening; preparation and planting of experimental plots in the school grounds to illustrate the benefits of rotation, fertilizing, spraying, mulching, etc."

On the practical side each teacher-in-training is required to teach two nature-study lessons. These lessons are assigned a day or two in advance of the teaching of them and are limited to an instruction period of 20 to 25 minutes.

As a rule, these lessons, indeed all that I have seen of them, would have to be classified as "object lessons." Leaves or seeds, a bird or a plant, maple sugar or corn starch, or some kind of objective material is brought before the class and a course of questioning and answering conducted. Much of this kind of work is necessarily "looking and naming" eked out with statements of function drawn from the pupil's recollection of their experience or the teacher's dicta. The term nature-study is unfortunately easily misunderstood to mean information about natural objects and phenomena. Teachers have been known to make a practice of holding up an object or even a picture of one, talking to the pupils about it and quite conscientiously calling that kind of instruction nature-study. The picture might as well be that of a king as of a cat so far as the method of teaching is concerned. The pupils received no practice or training in the investigation of their environment.

What part of any lesson is real nature-study? It is that part in which the pupil's reasoning and emotional powers are engaged upon what his senses and muscles are bringing to them. The rest of the so-called nature-study is probably geography or natural history or something else. The part of the lesson in which the child was *doing something* to satisfy his desire for knowledge or enjoyment was the nature-study part. The emphatic repetition of this truth will finally bring the young teacher to teach an *object lesson* fairly well.

The subject of a lesson may, for example, be the germination of seeds. The student-teacher brings to the class room dry beans,

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beans soaked 12 hours, beans soaked 48 hours or longer, in sufficient quantity to place seeds in each stage in the hands of the pupils. He questions to evolve comparisons of the conditions of each and observations of the changes in the seed-organs. You would call this an object-lesson but in the attempt to make a complete nature study in a 20-minute instruction period what more can any one do? Of course it falls far short of a richly educative investigation of the germination of the bean in which the child has treated the seeds from the start and has, under intelligent direction and questioning, periodically examined the awakening seeds and the developing plantlets. Nature studies worthy of the name are seldom exercises to be begun, continued and ended all in a single recitation period. But, on the contrary they are experiences in heuristic practice occupying it may be five minutes to-day, ten minutes the day after to-morrow, a quarter of an hour next week and longer or shorter engagements on several or many future occasions exclusive of few or numerous investigations out of school-hours.

It is clear that where teachers-in-training get their practice in recurrent circuits of a score or more of class-rooms they can neither practice nor observe the highest quality of work in nature-study. At the time of writing I cannot say that I have seen the practical work of the student-teacher carried higher than good object-lesson teaching.

Subject Matter Versus Method in the Normal School

GILBERT H. TRAFTON
Mankato, Minn.

The Normal School in its work of training teachers needs to give its students at least four kinds of knowledge: First, knowledge of the subject matter to be taught; second, knowledge of children; third, knowledge ot the method by which these facts are to be presented to the child and incorporated into his experiences, and fourth, a knowledge of a much broader field of subject matter than is to be taught the children. The knowledge of children comes largely thru actual contact with them in the training school, so that the teacher in the Normal School must give his attention chiefly to the three other fields.

It is evident that the first of these phases of knowledge is the first essential for teaching. Knowledge of the facts to be taught

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is the foundation of all teaching. When the amount of subject has been acquired, to what shall attention then be given, to the method of teaching this, to more subject matter, or to both? The writer believes that the teaching of method is the next most important step and that special attention should be given to this, and that no course dealing with the common school subjects should devote the entire time to subject matter to the utter neglect of method. Teaching of method is the professional phase that differentiates the Normal School from other schools. Without this, the Normal School fails to be distinguished from High Schools and Colleges.

These three fields are quite distinct: a person may be proficient in any two and yet lacking in the third, so that the Normal School must give its attention consciously and distinctly to each of these three fields and cannot assume that it can teach two of them, and that somehow the other will also be acquired. For example, it cannot be assumed, as it is often done, that if the Normal student is thoroly grounded in subject matter, she will in some way absorb the method of teaching it. Frequently the person with the greatest mastery of subject matter fails as a teacher.

It is sometimes assumed that the method used by the teacher in his class room will be copied by his students when they come to teach. Unfortunately this is exactly what is too often done, unless the students are taught better, and as a result, failure follows because the methods used for teaching young men and women in the Normal School cannot be used with young children in the elementary schools.

The method of teaching a subject is the most difficult and technical phase for the student teacher to acquire. Teaching the method is the special reason for the existence of the Normal School. It is the professional phase of the school that differentiates it from other schools. A Normal School that fails to teach this phase ceases to be a Normal School. It is generally recognized that the Normal School as a whole must teach its students how to teach, and it is equally true of each course given in the Normal School, that deals with common school branches, that it should teach the special method of its particular subject. The teaching of method is really the application of subject matter from the professional standpoint.

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What would be thought of a medical school which taught a lot of miscellaneous facts about bones, but taught nothing about the use the doctor would make of this knowledge in setting broken bones, but should trust the medical students in some way to pick this up later for themselves by experimenting on their first patients? And yet this is exactly the position in which the Normal School puts itself if it fails to teach its students how to teach nature-study, but trusts them to find this out by experiments with their first pupils.

Among the essential features involved in the methods of teaching are first, what to teach, and second how to teach. To answer the question of what to teach requires a large view of subject matter, an ability to organize this from the child's standpoint, a sympathetic understanding of child life, and some actual experiences in teaching children. To answer the question of how to teach demands the requirements already mentioned and in addition demands a knowledge of the ways by which the subject matter can most effectively be brought to the child's attention. This is all work for the expert and the Normal School should employ experts in the various subjects to teach the students how to do these things. To expect the Normal students to go out into the schools and work out for themselves the method of teaching the different subjects makes unreasonable demands of the teachers and works an injustice on the children with whom they experiment.

The evidence from recent experiments in psychology shows that training is specialized. Applying this principle to the training of teachers it means first, that a knowledge of subject matter does not give a knowledge of how to teach it; second, that general training in methods and pedagogy does not give the Normal student ability to apply this general method to special subjects and third, that training in teaching one subject, such as arithmetic, does not give one the ability to teach some other subject, such as nature-study. So that, if it is desired that a student teach nature-study, *she must be taught how to teach nature-study* and if it is desired that a student teach arithmetic, *she must be taught how to teach arithmetic.*

That a general course in the fact side of Biology does not prepare one to teach nature-study was clearly shown to the writer while he was supervisor of nature-study in a system of city schools. Most

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of the teachers, altho capable teachers in the branches, were not able to teach nature-study satisfactorily. A questionaire was sent to these teachers and the answers showed that their work in the Normal Schools had consisted almost entirely of general courses in Botany and Zoology dealing with subject matter only. They had received no training in the method of teaching nature-study and this lack was very apparent in their teaching.

Sometimes a strong pleasing personality is offered as a substitute for a knowledge of the real science of teaching. A doctor may be a splendid man but we are not willing to let this take the place of expert knowledge of how to treat typhoid fever in case of sickness. A carpenter was once recommended to the writer as "an awfully good man," but later experiences showed that he was "an awfully poor carpenter" and the knowledge of his goodness was little consolation for his lack of ability as a carpenter. A magnetic personality is always a great asset in any walk in life but it cannot be offered as a substitute for a special knowledge of the field in which the person works.

It is well known that teaching lacks the professional spirit usually found in other professions. The development of such a spirit is one thing needed to the advancement of the profession of teaching. A beginning in inculcating this spirit should evidently be made in those schools where teachers are trained. One essential in fostering this spirit is to make the teaching in these schools deal with the professional, that is, the method side of teaching. The work in nature-study in the Normal School must be more sharply differentiated from the work in science in the College and the High School.

The writer may briefly summarize his position by saying that he believes a course in nature-study in the Normal Schools should treat both of subject matter and method with special emphasis on the method side and should not confine its entire time to the discussion of subject matter alone. In his own course, the author devotes about one-third of the time to method and two-thirds to subject matter. This includes both the subject matter to be taught children and a larger view for the teacher's background. The proportion of time devoted to these two phases of subject matter varies with the grade in which the students are to teach.

The writer's usual plan of procedure in his own classes is first to take up a general discussion of the essential facts about the topic

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under consideration. Then method is taken up under the two headings of what to teach and how to teach. In considering what to teach a general outline is prepared of the facts that are adapted to be taught to children. In considering how to teach, definite topics for certain grades and seasons are selected and lesson plans are worked out on how to teach a single lesson on some particular topic. These plans form the basis for class discussion. Other large subjects are in turn taken up in the same way.

Human Interest and Nature-Study

By C. F. HODGE, Ph.D.

Professor of Social Biology,

University of Oregon, Eugene, Oregon.

"Life is response to the order of Nature."—W. K. BROOKS.

"And why (are these men revered)? Because they *humanized* knowledge; because they broadened the basis of life and intelligence."—MATHEW ARNOLD.

"I doubt not but ye shall have more ado to drive our dullest and laziest youth, our stocks and stubs from the infinite desire of such a happy nurture, than we have now to hale and drag our choicest and hopefullest wits to that asinine feast of sow thistles and brambles which is commonly set before them as all the food and entertainment of their tenderest age."—JOHN MILTON *Tractate on Education*, p. 8.

There is a suggestive analogy between eating and learning. In the one process food is built into the bodily life, in the other truth is assimilated into the mental life. Both functions are equipped with a complicated set of organs and both require a certain amount of effort or work. "*De gustibus non est disputandum;*" and still it is interesting to inquire why it is that eating or learning some things is pleasurable and wholesome, while learning or eating something else may be distasteful and injurious. In general, if the physical appetite is keen enough, the taking of food, however plain, is agreeable; and, if food is not to be had, A Digger Indian may derive some satisfaction from eating clay. In general, too, it is hard to induce children to eat anything that is distinctly distasteful to them, and under conditions of normal health and appetite this is not necessary, their natural tastes and desires being our safest guide. Some bulk and roughage is desirable but we do not hear much about feeding "water worn pebbles" to babies for the sake of "strengthening" their stomachs; although the experiment has been tried on a frog's stomach of feeding a piece of indi-

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gestible sponge to observe how the cells would react. It was found that the cells secreted vigorously, but they failed to recover their normal condition as they do when supplied with food. Does not a similar calamity to the learning mechanism, all too often, result from the effort to master subjects that do not contain some nutriment for thought and the mental life?

Too often we hear: "The child's interests are undifferentiated, Fellow teachers, take anything you happen to be interested in; for one thing is just as good as another in nature-study." When I see a three months old baby suck a meal as good as milk out of a water worn pebble, and not until then, will I cease to insist that the subject matter of a course in nature-study does make all the difference to the children between mental life and mental death.

There is but one thing of deeper educational significance than interest and this is the reason or cause of interest itself. We must seek this in the warp and woof, in the very web and tissue of life. Psychologists seem able to tell us little about the deeper biological rationale of interest. Students of child study give us, as yet, only superficial and fragmentary hints as to its genesis and scope, and even the pedagogues have done little more than bury this most vital of all subjects under mountains of misrepresentations and half meaningless technical definitions.

Nature touches the organism at a thousand points. Why does the life respond, warm, glow and fuse with one point of contact and not with all the rest? Why is milk better food for a baby than pebbles? There is but one answer to this question. The element which kindles interest, is responded to, stands in vital relation to the life. This relation or affinity is no arbitrary or fictitious matter. It is as much a matter of definite organization as brains or stomachs or bones. The response has been woven into the fabric of the species through the years of its past history. For thousands of years failure to respond has meant death, the response has carried with it life.

This fact is seen most clearly in the new field of animal psychology; since here the problem is simplified by narrower lines of interest and by absence of pretense and all other fictitious elements. Watch for a moment the robin in the garden. He stands erect and looks about him—his first interest, his own safety. A cat skulking along the fence is seen and immediately absorbs his attention. He flies to a tree and watches the cat disappear across

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the street. Assured of safety, he drops to the ground and now every sense is absorbed in his search for food. His hunger appeased, he secures food and carries it to the nest. A note of distress from a neighboring garden, and off he flies with loud cackle to render what assistance he can to his kind. With peace restored, he perches on the topmost spray of the elm and his being overflows in his song of good cheer.

Here, in epitome, we have the fundamental psychology of life, and with it, an equally basal philosophy of education.

Herbert Spencer has classified the ideas fundamental to education as follows: 1. Ideas centering about direct preservation of self. 2. Ideas connected with self-preservation indirectly, i. e., food and external necessaries of life. 3. Ideas relating to preservation of the family. 4. Ideas pertaining to the state. 5. Ideas associated with one's pleasures or the gratifications of his tastes—art, science, recreation, play and the like. If any are inclined to take exception to Spencer on the grounds of utilitarianism, surely this objection cannot be lodged against Ruskin, and he says: "And sure good is first in feeding people, then in dressing people, then in lodging people, and lastly in rightly pleasing people, with arts or sciences, or any other subject of thought."

"Making a subject interesting" too often carries the taint of insincerity. And, in such cases, the child may simply be enthused by the lively pumping antics of the teacher and not touched by the subject matter at all. It might be conceivable that an old duck should try to "enthuse" her flock of little chickens into learning to swim by dragging them into the water but fatalities would be in proportion to her success.

Human interests are "discoveries" not fanciful or ingenius machinations. It is the difference between finding a pure spring by the wayside and trying to work a pump, possibly, in a well gone dry.

A subject is interesting or it is not interesting according to the consistent order of nature and the constitution of the human body and mind. All human beings, with "the will to live" in them, who are not actual or potential suicides, mental or physical, all who have not been "spoiled" must find universally and perennially interesting the things that stand related to these ideas basal to life—safety from attack, when in danger; water, when thirsty; food, when hungry; shelter and clothing, when cold; religion, when afraid; arts and sciences, when hungry for beauty and truth.

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"Making a topic interesting" is legitimate only when we show its real relation to life when we "*humanize*" it, when we "*broaden the basis of life and intelligence*" to include and cover it. If we choose the right subject matter, however, this relation should be so direct and intimate that we shall need to devote a little time or effort to this end. Do we have to work hard to get little ducklings to take to water?

A brief reference to accepted definitions of "interest" may help us to view the matter from a slightly different angle.

A dictionary definition of interest is: "Attention with a sense of the special importance of a thing to oneself." Dewey has constructed a technically educational definition as follows:

"Genuine interest, in education, is the accompaniment of the identification through action, of the self with some object or idea, because of the necessity of that object or idea for the maintenance of self-expression" (and in further explanation he says) "Self-expression in which the psychical energy assimilates material because of the recognized value of this material in aiding the self to reach its end, does not find it necessary to oppose interest to effort. Effort is the result of interest, and indicates the persistent outgo of activities in attaining an end felt as valuable; while interest is the consciousness of the value of this end, and of the means necessary to realize it."

We owe much to the Herbartians for proving that there is no real antagonism between education of interest and education of discipline, the best discipline and the highest effort being obtained when interest is deepest and most whole-souled.

May we not, then, frame a definition of interest, not technical but of universal application to life, in the following simple terms? Interest is the relation of the organism to those elements in nature that are of vital importance to its life.

"How could youths better learn to live than by at once trying the experiment of living? Methinks this would exercise their minds as much as mathematics." (Thoreau) In the extremely complex problems of human education and life our aim must be to select the fundamental and universal for elementary instruction, relegating to later and more special education all those interests that are differentiated and technical, related to special trades, occupations or professions. And the more artificial, bookish, and superficial the child's life and education becomes, the more urge

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he needs these larger and deeper relations to realities of nature. Leaders everywhere are emphasizing this need.—"A practical, concrete course in nature-study, based not on books, but on the phenomena of nature themselves, ought to form a part of every elementary school curriculum, from the lowest to the highest grade."—*Portland School Survey, p. 111.*

Chiefly on account of the lack of this kind of instruction in the vital realities of nature and of life our boasted public schools are turning out all too many hoodlums and tramps, reversions toward savagery, armies of the unemployed and unemployable. Young animals, if they are not taught at the proper times may suffer atrophy or blighting of instincts and either die in consequence or live on permanently incapacitated for learning the particular lessons related to the vanished instincts. There is little doubt that many normal, human relations to nature suffer a similar crippling on account of lack of proper development in the nascent years of childhood and youth.

Our best recent estimates (*Penck*) indicate that for at least 500,000 years nature has been weaving lines of interest into the life of the human species. History covers scarcely one one-hundredth part of this time, and our modern sciences are hardly more than a single century old. We should hold these relations in mind when we speak of the primitive, fundamental and universal in human education. Here are the thousands of years of almost purely biological nature-study which not only developed the brain and mind so that man could begin the study of sciences, but laid the foundations in human character for civilization itself.

The era of lowest savagery, the tooth and nail, club and stone fight to "Subdue the earth," was undoubtedly much the longest period in the history of the race—possibly 470,000 of the half million years. Here the keenest interests center chiefly about direct preservation of self. With the subjection of the larger animals that hunted man for their food these longest, deepest lines of human interest run down and attach to the smaller, but even more powerful enemies—the rats and insects that, armed with the germs of plague and other diseases, threaten life and even to the bacteria and other parasites of man. Of course, during this period, too, the interests that related to support of life indirectly were active, and man learned the animals and plants that were of value for his food, clothing and shelter. But, health, conservation aside,

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the period of lowest savagery, when men lived solely by hunting, fishing and browsing—brute beasts live on this level, and always will—offers relatively little of educational suggestion, except, possibly that we "*accelerate*" the child's safe emergence from this stage.

Chief educational significance attaches to the steps by which man worked his way upward toward civilized relations to nature. The first great step consisted in taming certain animals. This is called by Shaler (in his Domesticated Animals) the greatest step of the human race toward civilization. This work is only well begun, and we need just now to extend this beneficent relation to cover many of our valuable birds and other insectivorous animals to save our insect tax of about one-seventh of our agricultural produce.

The final step into essentially civilized relations to nature was cultivation of plants. Here we first get stable land-hold and along with this develop the ideas of "Home" and "Country"—with love of home and love of country. With increased food supply, too, come stable community life, differentiations of occupation, manufactures and inventions, commerce, literature, art and finally science. And, again, our agriculture at its best is still in its crude beginnings with most inspiring possibilities of improvement ahead.

When we consider these fundamental relations we begin to see why elementary education is turning into these channels—animal industry, agriculture, and garden lessons, and we are assured that at last nature study has come to its own in the perennially vital and universal human interests by which nature always has and always will support and evolve the life of mankind.

Our public schools are not fancy-work circles nor art clubs; they are not scientific academies or even natural history societies. In their work of holding life true to nature their function is much deeper than any or all of these combined. The school course in nature study should do just one thing, i. e., bring very child into essentially civilized relations to nature. As Huxley put it; "To learn what is true, in order to do what is right." And Herbert Spencer means the same thing when he says: "To prepare us for complete living is the function which education has to discharge." And since the essence of life as far as we can know it is "Response to the order of nature," the higher and more perfect the response,

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the higher and more complete will be the life. In proportion as we discover the vital human interests in nature along the life-ways of the child will be our success in Nature Study—*measure for measure.*

College Freshmen as an Index of the Progress of Nature-Study

By James G. Needham
Ithaca, N. Y.

The Freshmen who have been coming into my laboratory in numbers for a score of years have shown to a marked degree the following characteristics:

1. Ability to memorize—for a season.
2. Ability to copy and to imitate.
3. Inability to trust their own eyes.

In the schools they have been taught to use books and charts and teachers, but they have not been trained to see things for themselves. Oftentimes the "banner pupil" from the schools has been in this respect most disappointing: an alert youth, perhaps eager to catch every word that fell from the lips of the instructor, eager to scan all the charts and diagrams, but indifferent about seeing the thing itself, preferring second hand information. I do not mean to say that all pupils have been so minded. Thank heaven, no! But I do mean to say that this attitude of mind has characterized the product of our schools.

Are not books the means of quick and easy acquirement of information? Have not the schools been largely satisfied with the memorizing and manipulating of words? Words, words, words! But words are symbols of experience only to those who know their content. Words express concepts derived from things. It is the study of things that puts meaning into them. Far too much of our system of recitations and examinations has been mere juggling with empty symbols.

The course which was designed as a partial corrective for this state of mind in Freshmen at Cornell University is one on the Natural History of the Farm, some studies from which have been published in this Review. It is required of Freshmen in the College of Agriculture during their first term. It puts them to work with their own hands on the things that belong to the soil.

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It does not trespass upon the work of other agricultural courses. It is elementary work in natural history—such as should be done by every youth before he reaches college age. We are giving this work in college only because we find it has not been given earlier, and because we believe it is much needed.

In giving this course we encountered two difficulties to which we believe that previous training in the public schools gives rise.

1. It is all field work; and some high school graduates seem to be imbued with the notion that a field trip is a picnic. This atittude of mind is quickly cured by having a definite program of work to be done in the field—as definite as any laboratory program —and by requiring a definite record in a stated time.

2. The records of the work done must be largely written records and there is great danger that the resulting table, annotated list, diagram, or what not, may, like the examination paper, be considered an end in itself. This is not easily cured. It is hard to divert the attention of some pupils—especially of some New York State pupils, trained under the system of Regent's Examinations—away from the final paper. It is common even in the field for students to overwork their notebooks and pencils, putting down whatever is told them about things, without inquiring very diligently of the things themselves.

These difficulties are becoming less pronounced. I am happy to be able to report progress. The leaven of the nature-study movement is working. More pupils are coming year by year, who know things out of doors, who are interested in the world they live in and in all their fellow creatures, and who want more personal first-hand knowledge of them: more who want to handle the raw materials and build up from them. Fewer come who are satisfied with the shadow of knowledge, not knowing its substance.

Another difficulty, less widespread, growing out of a too narrow training that is often mistakenly called "practical" is the desire of pupils to avoid "wasting any time" on things of no commercial value. The pupil of college age whose mind will react readily only to the stimulus of monetary values is already spoiled for scholarship.

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Some Fundamental Propositions for Nature-Study

By Maurice A. Bigelow

Teachers College, Columbia University.

The following propositions are not new and not radical. They are simply groupings of ideas which seem to me to be accepted by numerous workers in nature-study lines. They are submitted as a sort of inventory of the best nature-study as it now exists, and with the hope that constructive criticisms and additional suggestions may be offered by readers of The Review.

1. Nature-study should be defined as including:
   - (*a*) Simple observation study, primarily.
   - (*b*) Reading or lectures, secondarily.
   - (*c*) Common natural objects (living and lifeless).
   - (*d*) Common natural processes (heat, light, mechanics, electricity, etc.)
   - (*e*) Viewpoint of everyday life.
2. Nature-study should aim to give:
   - (*a*) Interest and sympathetic acquaintance with natural things.
   - (*b*) Observation as a method of studying nature.
   - (*c*) Useful information concerning nature as it affects human life directly.

3. Nature-study should be differentiated from the natural sciences as represented in the prevailing work in later years of high schools and in colleges. Natural science is knowledge concerning nature organized around the leading principles or generalizations, such as, atomic theory in chemistry, evolution and cell-theory in biology. Nature-study should avoid this type of organization and should be organized on educational lines in harmony with the definition and aims of nature-study.

4. Nature-study must be organized and adjusted to the established principles of elementary education. It can not permanently continue to ignore these principles.

5. The nature-study point of view or idea, as defined in 1, 2 and 3 above should prevail: In all studies of (1) living things (animals, plant and human); (2) lifeless objects (air, water, soil, minerals); and (3) physical processes (mechanical, light, heat, sound, electricity) below the second year of high school (i. e., in Grades I to IX, inclusive).

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6. The term "nature-study" seems best for such studies in Grades I to VI, inclusive; but "Introduction to Science" is a better general designation for the work of Grades VII to IX. Special sub-divisions of "Introduction to Science" may be hygiene, elementary agriculture, chemico-physical study, and vocational study (such as household and industrial arts.)

7. All studies of natural things in elementary schools should be scientific, although not science in the strict sense. That is, they should follow methods of science, but not its characteristic generalizations.

8. There should be logical organization of nature-study courses, and not merely a list of assorted topics for study. Beginning in Grade III, such organization should take the form of intensive surveys of the human relations to important groups of natural things, e. g., birds, trees, insects, cultivated plants, physical nature. In all grades there should be a wide choice of materials.

9. There should be organized lessons on all assigned work above the second grade and as far as possible in Grades I and II.

10. Incidental nature-study should be allowed in all grades; and at the expense of unassigned time. This provides for study of interesting specimens found unexpectedly. Of course, organized lessons are not possible in such cases.

11. Teachers of lower grades should avoid anticipating the assigned work of later grades; but should freely review the preceding work when opportunity offers.

12. Natural correlation of nature-study with literature, art, geography and practical arts should be developed along rational lines.

13. School gardens should be conducted with a nature-study rather than a vocational aim, so far as elementary schools are concerned.

14. Hygiene should be correlated with nature-study in grades below the seventh. In VII, VIII or IX there should be an intensive series of lessons in hygiene with a limited amount of physiology. Laws in some States are opposed to this plan.

15. Industrial education in the first six grades should be developed under the useful-knowledge aim of nature-study, and also in connection with industrial geography; and in Grades VII, VIII and IX as phases of "Introduction to Science". Industrial education intended to put all pupils in touch with the great industries

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should not be confused with vocational education intended to teach trades and life work. For example, agricultural nature-study should be industrial in aim; high-school agriculture is vocational.

Course in Nature-Study with Prospective Teachers

FRED T. ULLRICH
Platteville, Wis.

In a recent investigation* of the status of requirements in Nature-Study and Elementary Agriculture in the elementary schools in the several states and territories it has been shown that either Nature-Study or Elementary Agriculture or both are required in one or more grades of either or both of the city or country schools in 32 of the 53 states and territories: and taught, recommended, or suggested to be taught in an additional 13. This data clearly shows that Nature-Study and Elementary Agriculture have become integral parts of the courses of study in the elementary schools. It further implies that if the boys and girls in these schools are to be successfully instructed in these subjects, teachers must be specifically trained in the teaching of Nature-Study and Elementary Agriculture. This task naturally falls to the schools whose chief function is the training of teachers for the elementary schools the Normal Schools or other equivalent institutions. That these institutions have assumed the responsibility is evidenced by an examination made two years ago of 120 Normal School catalogues from 41 different states. These catalogues† showed that 85 of the 120 Normal Schools, or about 70%, offered courses in Nature-Study or Elementary Science. Of the many conditions necessary for the success of Nature-Study training of teachers in these Normal Schools one of the most important is the proper organization of a course in Nature-Study with these prospective teachers. The purpose of this paper is to consider some of the problems involved in such an organization. It seems fair to assume that no person is qualified to teach Nature-Study, or for that matter any subject, unless he has a knowledge of the materials of

*Present Requirements in the United States in Instruction in Nature-Study and Elementary Agriculture. Dr. Elliott R. Downing, NATURE-STUDY REVIEW, September, 1915.

†Ten catalogues contained announcements for the year 1910–11, 33 for the year 1911–12, 34 for the year 1912–13, and 43 for 1913–14.

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that subject, an appreciation of its aims and purposes, the principles that underlie the organization, and the best methods of presentation. The difficulties appear when the effort is made to equip the prospective teachers with these essentials.

One of the most significant things in the organization of a course with prospective teachers is the order in which these essentials are presented. It is a foolhardy notion and an utter waste of time to commence a course in Nature-Study with a discussion of the aims of the subject. It is sad to relate, but nevertheless it is true, that most students upon entrance to the work in Nature-Study in the training schools have very vague conceptions as to the content of the subject. Further, the lack of knowledge regarding the most elementary of nature forms is surprising. Miss Carrol* in a discussion of elementary science courses records the results of an instructor in one of the Normal Schools, who, after making a careful record of students entering his classes for a number of years, reports that the average high school student coming into his classes knows about eight birds, eight insects, and eight trees. How is this knowledge of subject matter to be given to the teacher in training? Shall the background be laid in courses in Biology and the Physical Sciences? There are those who would make such requirements. Undoubtedly, training in these basic sciences would make for efficiency but with the present tendency towards specialization in our training schools (lower grade course for primary teachers, upper grade course for grammar grade teachers, etc.) this is not generally practicable. Even in the schools where the training in the basic sciences is feasible there is urgent reason for instruction of students in the materials of nature in the Nature-Study class. In Biology and the Physical Sciences the logical organization in terms of the subject matter is a prime desideratum, if not at the beginning of these courses then at the close, but this is not true in Nature-Study. In this subject the child's immediate interests as related to the life of the community are the fundamental consideration, and thus these interests furnish the true basis for the organization. In other words, Nature-Study differs from Biology and the Physical Sciences not so much in content as in point of view. This point of view in Nature-Study can best be given to the prospective teachers by the presentation of Nature-

*Elementary Science Courses. Ora May Carrol, Nature-Study Review, October, 1914.

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Study materials in class room instruction. This does not mean, as some might infer, that the prospective teachers should be taught in exactly the same way, the same amount of material, and by the same method, as they are expected to use in their instruction in the grades. This is hardly a psychological possibility, and even if it were possible it would be undesirable because it would tend to make teachers of Nature-Study mere automatons, persons without initiative. Through the instruction that they receive the teachers must learn to appreciate, for instance, that the specific aims, materials, and methods must be different in teaching the cow to a group of first grade pupils than to a group of seventh grade pupils, because the dominant interests of these two groups are different. One of the difficult problems in the presentation of Nature-Study materials to prospective teachers is just how many lessons of forty-five minutes each are requisite to give them the Nature-Study point of view? Further, how many lessons are necessary to give an appreciation of the aims and purposes of the subject, for the organization of courses of study in the grades, and for making conscious the methods of instruction? The writer confesses his inability to answer these questions. All that he is sure of is that all of these elements must be emphasized. No teacher can be dynamic, virile, constructive, and enthusiastic who does not see the contribution of each particular lesson to the realization of the general aims of the subject, the relation of the general aims to the aim of education, and the aim of education to the fullness of life. The teacher of Nature-Study who feels keenly and deeply that the general aims and purposes of Nature-Study are to give a "speaking acquaintance" with the animate and inanimate world, to give practical information for ready adjustment in the environment, and to give training in problem solving will spiritualize every lesson, while the teacher who has no such outlook will be a mere school keeper.

One of the most urgent helps that the prospective teacher requires is aid in the organization of a course of study in Nature-Study for the elementary school. The wealth of material that may be used, to the inexperienced, is so vast that it tends to demoralize. When there are so many opportunities for topics that may be used for instruction, there may be a tendency to use too many of them with the result that none of them are well done. If the average teacher is given a course in Nature-Study that is workable in the

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grades will he be able to use effectively a course that is different in organization? There will be little difficulty if, in the training work, a number of courses are considered, emphasizing particularly the principles that underlie their organization. It is to be regretted there are so many courses in Nature-Study in the elementary schools that lack coherence, plan, and system, but that conditions are improving has been clearly shown by the excellently organized courses that have appeared in the NATURE-STUDY REVIEW within the last year.

The prospective teacher may have a knowledge of nature materials, appreciate the aims and purposes of Nature-Study, understand the organization of the course of study, and yet may fail if he does not have at his command the proper methods of instruction. In this consideration the point of view shifts almost entirely from the subject matter to the child to be taught. Teachers are not likely to succeed unless by intuition or from careful study they have learned to appreciate the psychological laws of child development. What are the differences in the mental characteristics of children in the primary, intermediate, and grammar grades? In what sort of materials (biological or physical) are they most interested in each of these divisions of the elementary school? If most interested in biological materials in the primary grades, in a more intensive study of biological and physical materials in the intermediate, and the practical aspects of both of these in the grammar grades, what are the psychological bases of these interests? What is the true basis of interest? Is it primarily instincts and capacities, needs, or environment, or a combination of all of these? A course in Nature-Study with prospective teachers must direct them to these problems. They must have as a part of their working equipment the knowledge of recent studies in answer to these questions. They must know that these questions have not been fully answered and thus be on the lookout for forthcoming answers, and better still resolve to aid in the solution of these problems through observation or special tests while teaching Nature-Study. Teachers who are not conscious of these problems that underlie successful method are destined to be in a chaotic frame of mind, lacking poise, ease, and grace, essential attributes of good teachers.

One of the fundamental elements of method that can not be over emphasized in training these prospective teachers is the use of

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concrete materials in Nature-Study instruction. A teacher who does not have a passion for nature, who gets his facts principally from books and not from first hand observation, who is content during his leisure moments to shut himself within four walls and not be responsive to the call of the wild, is destined to be mechanical and dry as dust. Nature-Study teachers must be inspired, and in no other subject is this so easily done as in Nature-Study, if the instructor of these prospective teachers is a well-balanced nature enthusiast. Such an instructor will never be satisfied to use the dead specimens of a musuem, or even the most carefully prepared and beautifully colored stereopticon slides when it is possible to take an excursion for a first hand study of the desired materials. The beautiful campuses ornamented with trees, shrubs, and flowering plants, so generally connected with teachers' training schools, the greenhouses and the green rooms, and the school gardens of these institutions are all indicative that the instructors are moving in the right direction.

Since the first hand study of nature is so very important, there is one feature in which the prospective teachers need especial help. This is in the conducting of an excursion with a class of grade children. The writer, from his own observations and from reports of others, feels that in no aspect of Nature-Study in the grades have teachers so frequently failed as in the excursion. If this situation has not been sufficiently appreciated it is due to the fact that we have been in the habit of forgetting failures and heralding successes. Some of the reasons that teachers fail in the use of the excursion are that they, in a measure, share the impulses of their pupils, a lesson out-of-doors means relaxation, more in the nature of a picnic than real work. The teacher as a result plans her work less carefully which always brings dire results. Some of the conditions conducive to failure are beyond the teacher's control. Children can not as readily concentrate out-of-doors as in the schoolroom due to the varied sensory stimuli to which they are constantly subjected, and further they have not formed the habit of thinking out-of-doors. The writer may be pardoned for mentioning a device that he has seen used to bridge over the period of uncertainty with the young teacher until he has gained the necessary power and strength to hold pupils to definite things at the time of the excursion. In the case in mind, the purpose of the excursion was the study of the corn plant. It was undertaken by the teacher

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with a seventh grade class. Each pupil was required before leaving the room to supply himself with notebook, pencil, and foot rule. The last was to be used in the making of measurements on parts of the corn plant. After arriving at the cornfield, each student was asked to place himself next to some corn plant within easy hearing distance of the teacher. After all were in position, the teacher asked questions and the pupils made observations in answer to these questions, recording their findings in their notebooks. Points of information which students could not get from observation were supplied by the teacher. The next day a corn plant was brought into the schoolroom, the same and other questions were asked by the teacher, and answers were given orally by the pupils. Such a lesson is invariably a success. The pupils have had the opportunity to think out the solutions to the problems without suggestions from classmates or the facial emanations of the teacher who is frequently too eager, without being aware of it, to have pupils express themselves in terms of his own reaction rather than those of the pupils. After pupils have developed the power of observation of nature materials out-of-doors, and the teacher feels free and easy with a class in the field, a much less formal procedure may yield larger educational returns.

In this stressing of the use of concrete materials and the excursion method as the first approach, the question arises as to whether or not pupils, especially in the fifth, sixth, seventh, and eighth grades should read on Nature-Study topics? Pupils in these grades should read, but they should not read for information until they have become interested in certain aspects of the subject through the study of concrete materials. Even after the reading has commenced there should be constant reference to the things themselves for verification of the points presented in the reading.

I the course in Nature-Study with prospective teachers gives the materials of the subject, the aims and purposes, a course or courses of study for the grades and the principles that underlie their organization, the best methods of instruction with special aid in conducting excursions for a first hand contact with nature, the course will not be complete unless it aids the teachers directly in the utilization of all of these elements in teaching Nature-Study to children. It is entirely possible for a teacher to know Nature-Study and to be able to talk felicitously about how to teach the subject and yet manifest awkwardness and uncertainty when put

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in charge of a class. We are all familiar with the indictment of the instructor of technical subjects who tells us, for instance, that students are not able without special help, to use the principles of physics and mathematics learned in the high school in mechanical engineering. The explanation of this situation is nothing more or less than the psychological law, the learning of a principle and its application are two different psychological processes. In this transition from principle to application in Nature-Study the rights and welfare of both pupils and prospective teachers must be guarded. As the first step, the prospective teachers should observe the teaching of Nature-Study in the grades by some one who is more or less expert, the observation of each lesson to be followed by a discussion of the technique of the recitation, the instructor of Nature-Study in charge. After this introduction the prospective teachers should teach Nature-Study in the grades under careful and sympathetic supervision. Two difficulties present themselves, one is that in many of the training schools there are no special supervisors of Nature-Study, the critics in these schools may not know the subject sufficiently well to supervise intelligently and effectively. Further, it may not be possible to get a sufficient number of classes in the elementary schools, to give all prospective teachers the opportunity to do practice work.

It is realized that not all has been said that should be said on the organization of a course in Nature-Study with prospective teachers. All that has been attempted is the selection of here a thought and there an illustration with the hope that some one with a larger experience may be stimulated to aid in the solution of the problems.

Nature-Study in the Geneseo Schools (Ill.)

JOSEPHINE BAILEY

Nature-study was introduced into the Geneseo Schools in Sept., 1914. It is taught in three grades: the third, fourth and fifth. A quarter of a day (after recess in the afternoon) being allowed for the work; the greater part of which is field work. Every afternoon, whenever the weather is favorable, a class is taken on a trip toward the edge of town and out into the country. The time given to these trips varies from one to two hours; sometimes longer. Each class takes a trip every sixth day.

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We make use of any available material, such as insects, animals, birds, flowers, weeds and trees. Whenever possible, material and specimens are brought back to the school room where they are cared for and studied. The children are also encouraged to keep a sharp look-out and bring in any specimens which they find on their way back and forth to school. Much good material has been secured in this way.

Each grade has certain general topics which we study during the year. On each trip we make a special effort to study and collect material for these subjects; but any other interesting material which we find is also used. Often specimens for the other grades are found and carried back for them to use.

Third Grade

During the fall in this grade we study some of the commoner insects, but give special attention to the study and collecting of insect homes. The children study these homes for the purpose of discovering the material used in their construction; the manner in which they are constructed; and the use of the home. They study to find out whether the home is made for the protection of the larva or for the adult; for the protection of the insect while eating: or as a place in which to rest.

Leaf rollers, leaf miners, nests of the silver skipper, wasps nests, ants' nests, galls, web worms, spiders' webs, the homes of such insects as live under sticks and stones, and all kinds of cocoons are collected and studied. Many of them are used in making a chart. This saves the specimens for future use and preserves them much better than laying them away in boxes.

We also study the dissemination of seeds. We divide them into groups according to the manner in which they are scattered; as the flyaways; the sailors; the jumpers; the coasters and skaters; the tumblers; the tramps; nuts; and bird's seeds (Fultz). A number of these groups are arranged in charts for comparison and preservation.

A few of the common weeds, flowers and trees are studied. The children learn to recognize the trees during the fall by their shape, the leaf, and the bark. In the winter the leafless trees are studied and in the spring we continue the study of the same trees as the buds begin to swell. We also make a special study of one or twe of the evergreens during the winter and some of the winter birds.

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During the spring we continue the study of insect homes and before the leaves are out we make a thorough hunt for cocoons. Last spring we found a few which had been punctured. These we opened so that the children might have the opportunity of studying their construction; and they were much interested in examining the form of the creature which had made its home in the cocoon during the winter.

Fourth Grade

Here we take up the subject, How Insects Live? By the end of this year the children know something of the anatomy of the insect: how it breathes and eats and some of its habits. By keeping the larvæ in breeding cages we are able to study the whole life history of such insects as the black swallow tail and monarch butterfly, and the moths of the tomato worm and cecropia caterpillar, and many others. We watch the various molts of the larvæ when we succeed in securing them in the early stages; the manner in which the larva prepares for pupation; the varying length of time required before the adult insect emerges from the pupa case; and the laying of the eggs.

We also study wasps; making a special study of the mud dauber and its nest; the purpose for which the nest was made; the larvæ in the nest; and the manner in which the nest is provisioned by the adult wasp for its young.

In this grade we begin making a collection of moths, butterflies and insects.

Under weeds, flowers, trees, and birds we add a few new ones to the list already learned in the third grade, beginning the study in the fall and carrying it through the winter and spring.

Fifth Grade

In the fall we begin the study of the ant. We find an ant's nest, dig it up and place it in an artificial nest which we have ready to receive the ants. (For description of such a nest, see "Insect Life" by Comstock, page 278). After some time spent in observing these ants and those which we find on our trips, and the children find out all they can in this way, we read many stories of the various kinds of ants.

While studying the ant we also study the aphid and its relation to the ant.

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In this grade, as in the third and fourth, some of the trees and plants are studied. Here, while studying the trees, we make blue prints of the leaves of all the trees which the children have learned to recognize. This helps them to fix the form of the leaf in mind and they pay more careful attention as no one is allowed to print a leaf which he does not know. These are later made into booklets.

The study of trees and birds is carried on through the winter as in the preceding grades. By the time the children leave this grade many of them know by sight from twenty-five to forty or fifty birds.

In the spring we study the honey bee and the bumble bee. Last spring an observation beehive was placed in this grade so the pupils might watch the bees at work. One of the ministers of the city, who is a great lover of bees, donated the use of one of his swarms and he also gave some very interesting and instructive talks on the life of the bee.

Aquaria are introduced into all the grades in the spring. Last spring some tiny mud turtles and little bull-heads were brought in. These were used in the third grade. In the fourth grade we studied pond snails, water striders and whirligig beetles, and in the fifth grade the cray-fish.

We find that we cannot adhere too closely to any set outline in nature-study work. The same general topics can be taught each season, but each day's lesson must be given from the material at hand.

In all of the nature-study work the aim has been to awaken the child to a realization of the common things which are to be found about him; to cultivate his powers of observation; to lead him, through his observations, to make inquiries, then investigations; and finally, through this training, to lead him to understanding; to awaken in him a love of the beautiful; a regard for what is true, and above all else a deep reverence for and a real love of nature.

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The Tussock Moth—His Life Story*

MARY L. DOUGHERTY

The tussock larva had just come from the egg. He was a queer little fellow, thin and rough-looking. He raised his head and like any boy wondered, "What next?" He caught sight of something waving near him. He stretched out his antennæ. Something smelled good. He started toward it. It felt cool and soft. He tried his little teeth on it. How good it tasted. He had found his first elm leaf. After that he ate and ate. He hardly took time to sleep, but once in a while he stopped to enjoy the warmth of the sunshine. One day he felt especially good, and ate more than usual and stretched himself harder than ever before in the sunshine, Suddenly his coat split up the back, as any boy's would when he grew too fast and got too active. But unilke the boy, this small larva quietly crept out and ate up his old coat.

Wonder of wonders, he was not left coatless, for he had taken with him out of his old skin a new one—like the old, yet unlike it. The ground color was yellow; just back of the head were two brilliant spots of red; down the middle of his back stood a row of four tufts of hairs—tiny, but very much like a blacking dauber. At the very end of his body was another tuft of hair, only here it was longer and did not stand straight up but slanted back as a hunter might carry his gun over his shoulder. At the front, just in front of the little red spots, were two tufts of hair, slanting toward each side and the front and not so heavy as the others. Perhaps these helped him to smell out his food.

Now he was a happy, care-free little larva, for all he had to do was to eat and grow and split his coat and come out in a new one, over and over again. Being so care-free, he one day started on a journey of discovery. Why, I don't know. Perhaps he longed for finer food. At any rate, as he went down the trunk of the elm tree, a great giant, (an amateur naturalist) discovered and captured him. He was carried away and shut in a glass case with plenty of light, air and elm leaves and he didn't seem to mind at all.

After a time, he grew tired of eating. He perhaps looked again for new occupation. He found he could spin. What fun! He would make himself a nest. He spun and spun and spun, fine silky threads all about himself and fastened them to the leaf on

*This story is written by a student teacher, and is the result of the work in a class in Elementary Science, preparing for instruction in the lower grades.

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which he sat. As he spun more and more, the little case, or cocoon, grew thicker and thicker with little larva on the inside. Then he became tired of this also, or did he run out of silk for the spinning? Anyway, he went to sleep. But not so fast alseep that he could not stir very much if anything disturbed him.

While he slept, he grew, just as any boy would, and he changed too. It was a long, long time that he slept, by insect time. It was as though a boy should go to sleep and sleep until he became a man. But yet it was different.

One day he really waked up. He had been in bed long enough, and out he came. One end of the little silk cocoon had been left loose enough so that he could crawl out. It was quite an effort, and he broke the dried leaf, on which he had spun his cocoon, from the twig, in getting out. But that did not matter, for there was the twig to stand on and stretch himself after his long nap. When he did stretch himself, lo—he had wings! There were no tufts now, but instead of the two on his head were two beautiful feathery antennæ which lay back near the sides of his head or stood out toward the front. His wings were a beautiful, soft brownish gray on top, but almost white underneath.

As he rested there, he saw near him another cocoon. Resting on the outside of it was the prettiest little furry-looking bug, as white and soft as a kitten, and with a brown head and big bright eyes.

Little Larva was Little Larva no more since his long sleep, during which the giant called him a pupa. Now he was Tussock Moth.

When Tussock Moth discovered the bright-eyed, furry bunch near him, he knew at once that she was a little tussock moth, too, even though she had no wings.

He flew to her at once, and she became his mate.

Soon a bunch of snow-white eggs covered the cocoon where the little wingless moth sat. Then she disappeared, and the giant did not learn her fate. Perhaps she made a meal for a hungry bird, who turned her into song.

At all events, her work was done, for from the eggs she had laid would come more little larvæ like the one with which our story began, and such as she herself had once been.

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Intensive Gardening

ELIZABETH P. SHEPPARD
Trenton, N. J.

If school gardening had for its primary aim the production of flowers and vegetables, if it was a mere process, then the topic would have been worn threadbare long ago. But every school garden has its own story. Those of which I read such interesting accounts differ from ours in one or more of the following points: First, they have much more space per child, plots four by eight feet or more being assigned. Second, in many cases they supply some vegetables for family use, or bring some financial return. Third, some of the children with assistance from a teacher care for the garden during the summer.

Granting the desirability of each point, we have been obliged to work under different conditions and have found it worth while.

All that the Normal School at Trenton, N. J., has available, at present, is a plot of ground which measures twenty-five by fifty feet. In this plot some two hundred children of the practice school work out garden projects. To be thoroughly up to date, we must needs substitute *project* for the older terms *plan* or *problem*. These children work individually or in groups, and about one hundred Normal students from the nature-study classes assist in every activity, learning how to plan and conduct this vital part of nature-study.

Plans naturally vary from year to year. "The best is yet to be."

The following is an outline of the garden as conducted during the spring of 1915:

I. Preparation.
   A. With the Normal students.
      1. The sash bed (one three by six feet is located in the north east corner of the garden).
         a. Indoor lesson on construction and use.
         b. Planting.
      2. Measuring the garden.
      3. Finding out the number and size of the classes which would plant.
      4. Consultations with the grade teachers and decisions as to the projects.
      5. Adjustment of points (2), (3) and (4).

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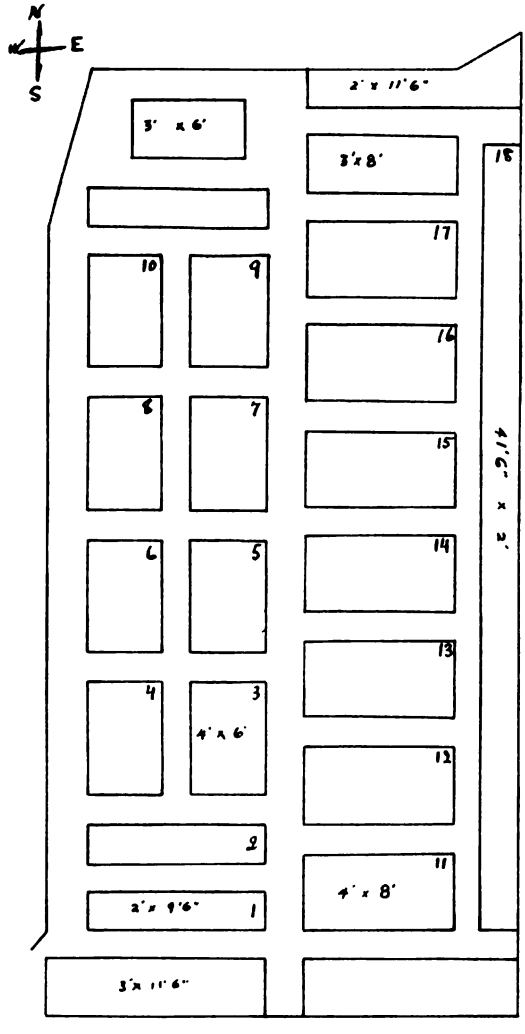

School Garden 1915
50' x 25'

Scale 1-10" to 1'.

KEY TO GARDEN PLANS

1, 2, 3, First and Second Grades.
4, 5, 6, Third Grade.
7, 8, 9, 10, Fifth Grade.
11, 12, Sixth Grade Boys.
13, 14, Sixth Grade Girls.
15, 16, 17, Seventh Grade Girls.
18, Seventh Grade Boys.
Sash bed in northwest corner.

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6. Drawing of garden plan to scale. Copies sent to each grade teacher.
7. Making six dozen cypress stakes—each one inch square and sixteen inches long.
8. Marking out garden.
   a. Making measurements.
   b. Driving stakes.
   c. Tying twine around plots.
   d. Making paths (the older boys assist).

(NOTE—All that is given below under B is considered by the Normal students somewhere in the course).

B. In the Practice School.
   1. Seed testing.
   2. Soil testing.
   3. Simple experiments in plant physiology.
   4. Use of garden plans for arithmetic problems.
   5. Bottled sets of flower and vegetable seeds sent from room to room.
   6. Sending for penny packages of seeds for home gardens.
   7. Discussion of project and special lessons preparing for it as:
      a. Sixth grade lessons on plant improvement.
      b. Seventh grade lessons on cereals.
   8. Assignment of positions so that confusion is avoided when the classes reach the garden.
   9. Directions as to method of planting.

II. Planting.
   A. Work of Normal students.
      1. Assisting grade teachers.
         a. Distributing tools.
         b. Distributing seeds.
         c. Taking charge of groups while planting.
         d. Planting demonstration plots.
      2. Transplanting some of the sash bed plants.
      3. Planting a few unoccupied corners.
      4. Observation.

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B. In the Practice School.

1. First Grade.
   a. Individual plots.
   b. Each child planted radish and sweet alyssum seed and onion sets.
2. Second Grade.
   a. Individual plots.
   b. Child chooses one or more of the three named above.
3. Third Grade.
   a. Group work.
   b. Eight varieties of vegetable seeds planted. Some seedlings transplanted from sash bed.
4. Fourth Grade.
   a. They take charge of a wild flower garden which is not in this plot.
   b. Plant a small plot with white and sweet potatoes.
5. Fifth Grade.
   a. Return to the individual garden plan.
   b. Children choose seed, guided by teacher as to fitness.
6. Sixth Grade Girls.
   a. A plot to show plant improvement. Wild and cultivated varieties of iris, columbine, daisy, etc., planted side by side.
   b. A plot of flowers.
7. Sixth Grade Boys.
   a. Group work.
   b. Seeds of plants with industrial value: flax, hemp, broom corn, peanuts, sugar cane, cotton.
8. Seventh Grade Girls.
   a. Group work.
   b. Ten varieties of radish seed were planted in order to solve the problem: What variety of radish seed is most desirable for out of door planting in this locality?

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9. Seventh Grade Boys.
   a. Group work.
   b. Cereals: several varieties of corn, wheat, rye, oats.

Few of the pupils of the Practice school spend the summer in Trenton, so they are not organized to do summer work. One of the caretakers of the grounds spends a few hours in the garden during the summer, tying up the plants which need it and keeping the weeds from predominating. The fall garden, with all of its defects as a garden, is a storehouse of nature-study material that is practical and concrete.

Some of the topics which are studied are: seed dispersal, weeds, plant propagation, insects and methods of controlling them. Among the harmful insects are potato "bug," cabbage "worm," parsley "worm," tomato "worm," corn "worm," squash bug and plant lice. Useful insects are illustrated by the work of the lady bird beetle and ichneumon flies, the latter being found on the tomato worm and cabbage worm.

There are many things to do—crops are harvested, seeds gathered; some plants are taken indoors, as the cotton, with the hope that it will complete its cycle, sweet alyssum and petunia for window boxes; the flax is gathered and piled up so that it may decay thus freeing the fiber; brooms are made from the broom corn.

The grades all plant bulbs in the fall but the bulb beds are not in this plot so that is another story.

It is obvious that every Normal student does not actually plant, care for, and harvest vegetables and flowers but she might do that for a lifetime without any knowledge of or ability to teach the processes involved, while if she cannot get both theory and practice from this garden work she may as well,—to quote Arnold Bennett, "Curl up and expire for the root of the matter is not in her."

Editorial

We are living in the midst of an educational revolution. Ten years ago the report of the Commissioner of Education (1904) contained scarcely one per cent. of subject matter with vocational

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flavor (the chapter on manual training) and only a whisper regarding efficiency in teaching. To-day, the 1914 report, gives about eleven per cent. of its space to distinctly vocational matter, much more to matter with vocational flavor and a conspicuous place to methods of testing the efficiency of both the teacher and the school system. Chapters on "Agricultural Education," "Education for the Home," "Education for Child Nurture, etc.," "The Trend of Civic Education," "Progress in Vocational Education," all make one realize that public education is dealing more with materials that touch the daily lives of the masses, less with many traditional subjects.

In no uncertain voice comes the demand that this change be accelerated until the unproductive subject matter in the course of study is replaced with that which meets present-day demands. Note this excerpt from a recent address of the President of the Board of Education of New York City. Thos. W. Churchill:

"The core and centre of our public school teaching needs to be completely changed. It was transported from a system which proposed to fit children for a life of learned discourse, minute scholarship and composition with the pen. The lineage comes down as straight as the line of recorded live stock. But our boys are headed straight for the store and the factory. The continuation of our bookish, literary-centered course of study is therefore absurd, unfair and an irreparable damage to those on whom it is imposed.

You must substitute for this beautiful but exotic culture, for this over-emphasized grammar language, and literature, a preparation for successful mastery of the principles of industry and trade. You must do it because it is a world of industry and trade in which the men who are now children in the schools will live. You need a grammar of machinery instead of the analysis of the parts of speech. You need a mathematics of costs and losses, of construction and estimate, instead of the Euclidean geometry of the present course. You need a geography of resources, of products, of lines of transportation in place of the unfunctioning study of that name which is current in the schools to-day."

One might suspect that this is the propaganda of an overzealous business man, biased in his educational opinions. But read this from the pen of a professional educator, author and recognized leader. It is quoted from the editorial in *Journal of Educational Psychology*, Sept., 1915, entitled "Fundamentals in Education."

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"Is arithmetic fundamental? Assuredly not! Even a casual inquiry will show that in all lines of activity.... the need for arithmetic is vanishingly small..... Is hand writing fundamental? The business man or business woman scarcely uses the pen ....and even in social correspondence, it is felt to be something of an infliction to have to decipher script when mechanical writing is so much clearer, neater and more legible. Is spelling fundamental? Recent studies have shown that ninety per cent. of all the words that are ordinarily used in writing are found in a list of 1000 words. Of these not over 200 words would give trouble to any one individual, and these could be learned with ease in twenty hours of properly distributed practice. Is grammar fundamental? All experiments agree that its contribution to efficiency in the use of language is negligible..... Of all the traditional elementary subjects reading alone retains its place of primary importance."

And with the introduction of standards and tests in arithmetic, spelling, writing, reading we are in position to speedily detect defects in training. Then with the newer methods, based on scientific studies, we can impart the necessary knowledge and skill quickly. The child should be easily equipped with these tools of an education early in the grades. Surely we may have time in the elementary school, then, for an adequate basis of scientific fact and an appreciation of the scientific method of thinking. This, Bagley thinks, is one of the fundamentals in education. It surely must be in an age that is dominantly scientific. It is good commonsense, assuredly, to use as the core of the elementary course, after the child acquires a reasonable command of the tools of education, at least the elements of science fundamental to healthful living, agriculture and the trades. These three lines include the vocations of ninety per cent. or more of the children in the elementary schools, a large percentage of whom will go no farther. The boy or girl in the work of the home, the shop, the farm gains knowledge at first-hand from objects much more often than from books.

Yet our school work has long neglected training in such acquisition. He must reason to correct conclusions, if at all, on the basis of his own observations, yet his school work has taught him to take his opinions second-hand and has drilled him little in such independent thinking. Habits acquired in shop, laboratory, garden and school-kitchen are much more nearly related to those needed in winning a livelihood than are those of the average school room. And the

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first demand we make is that the boy or girl shall be self-supporting. That assured, he should have a ready command of language to communicate effectively with his fellows and take his place easily in society; he should know his local social and political institutions and be habituated to use them wisely; he should be led to appreciate art as a means of enjoyment and stimulation.

What an opportunity is offered the wise superintendent to lead a community out of educational stagnation into such an adjustment to the modern environment as will make for renewed social progress. One dares almost hope for the amelioration of poverty and vice when schools address themselves to problems of production and the establishment of habits.

Nature-study, and the nature-study method in gardening, agriculture, and elementary science as a whole has its opportunity. If schools do not continue to adopt it, it will be because its leaders are too stupid to formulate wisely the subject matter and train teachers adeuqately. Indeed even such stupidity can not long stay its progress. It is a manifestation of the rising tide of popular commonsense education and that may be checked but not stopped.

Book Reviews

AGRICULTURAL EDUCATION FOR TEACHERS. G. A. Bricker. Pp. 172. American Book Company. $1.00.

In glancing over the chapter titles, Chapter 7 was the one that arrested attention: Elementary Agriculture and Nature Study. The author is of the opinion that the "enthusiasm which has in past years characterized the Nature-Study movement is on the wane," and that the "Nature-Study idea does not today command the prestige and attention in the educational world that it promised only a few years ago." He does think it has won a permanent place in the elementary school. The author then proceeds to discuss the purposes of Nature-Study, suggesting a number of aims, and giving his opinion as to the relation between Nature-Study and the sciences. Readers of the REVIEW have seen a sufficient number of articles and editorials in our pages to make it evident that our opinion as to the decadence of Nature-Study is directly contrary to that of the author, and furthermore we have presented abundant evidence to substantiate our opinion. In Chapter 8, on "What is Elementary Agriculture?" and Chapter 9, on "Agricul-

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ture as a Means of Education," the author presents the aims of Agricultural Education and it is notable that they are in large measure co-incident with the aims of Nature-Study. He does not for a moment think that Elementary Agriculture is merely an attempt to teach the farm lad how to increase his yield of corn and hogs. In fact, if any criticism is to be made, it is that he expects to accomplish too much through Agriculture as a means of education. It trains the child to win his needed food, clothing, and shelter. There is a wealth of knowledge in it that might well occupy him a lifetime. It serves "to whet and expand his intellect." "No other subject offers greater opportunities for the complete and harmonious development of man's mind, might and morals." He thinks that rural people have always been famous for their refinement, at least for the essential elements of refinement, and that this is due to the education which they have receive from Agriculture. It is the best means to culture and to ethical training. "The farmer's canvas is his fields, and his art materials are the soil and the great forces wrapped up in the physical manifestations of Nature. The artist-farmer brings perennial comfort and gladness to the countless missions of the race."

Chapter 10, on Pedagogical Problems Involved, and Chapter 11, on Administration in Teaching, are among the best in the book. They review some of the simpler general methods of teaching and apply them to the special problem of teaching Agriculture. They suggest some of the unsettled problems. The last three chapters of the book discuss some of the concrete methods to be used, including demonstration plot, various home projects, and Agricultural Clubs. The book undoubtedly is merely the precursor or a series of books on this general subject, and probably is as good a presentation as could be expected thus early in our contact with the problems of Agricultural Instruction in the Grades.

RURAL LIFE AND EDUCATION. Ellwood P. Cubberley, pp. xiv + 367. Houghton Mifflin Company. $1.50.

This is an exceeding stimulating book. The first two chapters, on "Changes in the Nature of Rural Life" and the "New Rural Life Conditions," make admirable use of the data found in recent census reports and local surveys. The concentration of urban population, the increase in speculation in farm lands, with the abnormal rise in prices, the increase in tenantry, are all brought

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out in striking maps and diagrams, and their bearing on question of rural education is made quite clear. Chapter five on "The Rural Needs of Today," discusses the church as a social center, the school and the new activities that it must undertake to be of the largest service in the rural community. Chapter six is inspiring in giving a number of examples of what has already been accomplished. The second part of the book, including the remaining chapters, is devoted to the rural school. Again the reader is surprised at the continued evidence of the changes that have taken place. The chapters are not theoretical discussions of what ought to be, but relate what is already accomplished. True, the accomplishment is local, but just such a book as this will help to spread the good things over wider territory. Such matters as the larger school unit, the new building and its equipment, the reorganization of the curriculum, and the new type of teacher, are discussed. The book is one that should be in every teacher's library, if for no other purpose than to give inspiration and a realization of the advance that educators are accomplishing.

EDUCATIONAL RESOURCES OF VILLAGE AND RURAL COMMUNITIES. Joseph K. Hart. Pp. x + 277. Mac Millan Company. $1.00.

This is a co-operative book, various chapters having been written by experts on particular topics. Mr. Hart has himself contributed several of the chapters. The key-note of the book is this: that in every community there are people, projects, and processes that are efficient means of education, and it is worth while for the teacher, especially the rural teacher, to make use of these educational resources. This is true whether the chapter is considering the economic activities, the health, the local history, the political life, play, the moral and religious life, or one of several other phases of the community's activities. Each chapter has appended to it a good bibliography, including books, pamphlets, and magazine articles. The first four chapters, including the physical and human resources of the community, and the economic activities, together with the chapters on the moral and religious life of the community, have valuable suggestions in regard to the community survey along these lines. Chapter 11, on Recreation, Play, and Amusements, will be a boon to anyone who is endeavoring to provide clean recreation for a group of children.

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CHILD TRAINING. V. M. Hillyer. Pp. xxxix and 299. The Century Co. $1.60.

The book is primarily a system of education for the child under school age. The author realizes that the years before the child starts to school are really the most important of its life, important in the training in proper habits, in the foundation of his physique, and in the development of personality and individuality. There are a number of very excellent things for the Nature teacher. Among the habit drills that are suggested are many on observation. Directions are given, for instance, for discriminations in the sense of taste, of smell, of feeling, of pressure; and much of the material suggested is Nature material. The use of pictures is discussed, and a number of concrete illustrations are cited of the way in which the child's observation may be stimulated by the Nature pictures. Chapter 8, on Information, includes desirable experiences with many Nature materials. Just this list of desirable outdoor experiences is worth while as a check list to see that the little child is given as much contact as possible with those experiences that are so important in storing his mind with the images that he will need to use in later life.

THE TEACHING OF BIOLOGY IN THE SECONDARY SCHOOL. Francis E. Lloyd, and Maurice E. Bigelow. Pp. viii and 491. Longmans, Green & Co. $1.50.

This is a reprint, with corrections and additions, of the first edition, which appeared in 1904. While it is primarily for the high school, several of the chapters will be of interest to Nature teachers; Chapter 7, on the Value of Biology as a Means of Education; Chapter 2, on Nature-Study; Chapters 5 and 7, on the Materials of the Course in Botany and Zoology. Each of the chapters has a good bibliography which puts the student in touch with many of the best things that have been written on the particular subject under discussion. There is no other book that is at all comparable to this in the wealth of material and suggestiveness for the teacher of biology in the secondary schools.

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